73 AMATEUR RADIO

Hand-helds!

Home-Brew:

Atari ST color SSTV—cheap!
Bargain booster for your HT
Under-$1 hamsat antenna
A VOX on your 2AT

Reviews:

Breadboarder's Paradise: Elenco test Blox
Ramsey $30 40m transmitter kit
Tale of two HTs:
Yaesu 470 dual-band micro HT and
ICOM 2SAT 2m handheld
Communications Satellites

12
0 74820 08725 1

ICOM

Dual Band Mobile & Handheld

DOUBLE YOUR PLEASURE
DOUBLE YOUR BANDS

Dual Band Radios from ICOM!
Double your operating pleasure with Icom's new dual band IC-3210 mobile and IC-32AT handheld FM transceivers. Each unit incorporates a wealth of special features and options designed to move you into the forefront of today's expanded 2-meter and 440MHz activity. Icom dual banders: the FM enthusiasts dream rigs!

Wideband Coverage. Both the IC-3210 and IC-32AT receive 138 to 174MHz including all NOAA weather channels, transmit 140 to 150MHz including MARS/CAP, and operate 440 to 450MHz. Tota! coverage of today's hottest FM action!

Full Duplex Operation. Simultaneously transmit on one band while receiving on the other for incomparable dual band autopatching!

20 Memories. Store any combination of standard or odd repeater offsets and subaudible tones.

Powerful! The IC-3210 delivers 25 watts output on both bands. The IC-32AT is five watts output on both bands. Selectable low power for local use on both units.

Programmable Band and Memory Scanning. Includes easy lockout and recall of various memories. Exceptional flexibility!

Repeater Input Monitor Button. Opens the squelch and checks Tx offset simultaneously.

Priority Watch. Monitor any channel for calls while continuing operation on another frequency.

Optional Beeper. Monitors for calls with your subaudible tone, then gives alerting beeps.

Double Your Bands with Icom's dual band IC-32AT handheld and IC-3210 mobile, and double your operating pleasure on 2-meters and 440MHz.

ICOM
First in Communications

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-7619**
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada
All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 321032AT688

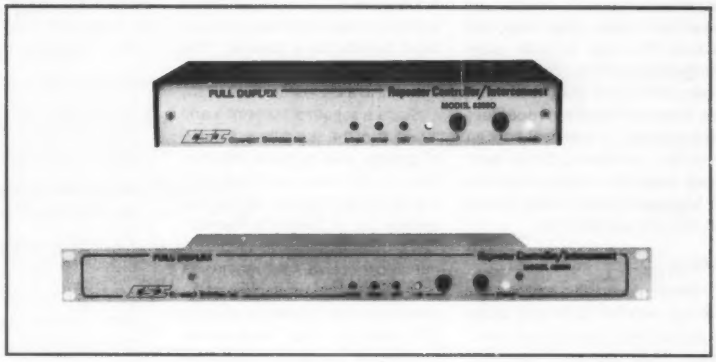
CIRCLE 354 ON READER SERVICE CARD

NO OTHER FULL DUPLEX PATCH OR REPEATER CONTROLLER GIVES YOU SO MUCH FOR SO LITTLE

FULL DUPLEX AUTOPATCH USING DUAL BAND RADIOS...

Most people are within radio range of their base station 90% of the time. Why not install an 8200 and enjoy your own private full duplex mobile telephone system? Only 3 connections are required. The 8200 provides both full duplex and half duplex operation.

(Inquire about Private Patch V for simplex operation. Operates in enhanced sampling or VOX modes...user selectable.)



ADVANCED AUTOPATCH FEATURES...

The 8200 incorporates many features which are simply not available in any other product. For example...

90 Phone Number Auto Dialer: The 8200 will store (in non-volatile memory) 90 phone numbers which can be dialed with abbreviated two digit key codes. The auto dialer is programmable over the air or with the built-in keyboard.

Last Number Redial: Redialing the last number called is reduced to a single digit (plus access code).

Hookflash: Operates call waiting etc. Simply press * three times. Only CSI has it.

Call Progress Tone Detection: Busy signals and second dial tones are detected and cause automatic disconnect. Ample time is allowed for dialing second dial tones when required.

Powerful Toll Protection: One to four digit sequences can be restricted. For example, you could lock out 0, 1, 976 and 911. Additionally, digit counting will prevent dialing more than 10 digits. A separate 2 to 6 digit toll override code allows making toll calls when desired. Re-arm is automatic.

Dial Access Remote Base: The 8200 can be accessed and controlled from any telephone. Call up and drop into the system from your desk phone at lunch hour!

Ringout Selective Calling: Ordinary calls can be received using ringout (reverse patch) and mobiles can be selectively called using regenerated DTMF.

Optional ANI access codes: This option will allow up to 50 separate (remotely programmable) 1 to 6 digit access codes. A call can only be disconnected with the code that initiated the call. Thus eliminating sabotage disconnects.

AN ADVANCED REPEATER CONTROLLER...

The 8200 is a powerful repeater building block and is perfect for all private and club systems.

The 8200 contains everything necessary to convert any receiver and transmitter into a powerful repeater. Only one connection to the receiver and two to the transmitter are required.

Menu style programming is accomplished with the built in keyboard and display. The user can select a 3 digit repeater up/down code, CW ID message, CW ID interval, hang time, activity timer time, and you can even select any Morse character as a courtesy beep!!

An optional plug-in CTCSS board converts the 8200 to private use. The incoming CTCSS is filtered out and replaced with fully regenrated tone. 32 tones are dip switch selectable.

STANDARD FEATURES...

- Line in use detection
- 90 number auto dialer
- Redial
- Hookflash
- User programmable CW ID
- Regenerated tone/pulse dialing
- Selectable activity, timeout and hang time timers
- 3 digit repeater on/off code
- Two remotely programmable 1-6 digit autopatch connect codes. (Regular and Toll Override)
- Powerful toll protection
- Remotely controllable relay (relay optional)
- Ringout (reverse patch)
- Busy channel ringout inhibit
- Ring counting
- Auto answer
- Telephone remote base
- DTMF-DTMF selective calling
- Courtesy beep (any Morse character)
- Automatic busy signal and dial tone disconnect
- MOV lightning protectors
- Non-volatile memory

And MUCH more!

CONNECT SYSTEMS INC.
2064 Eastman Ave. #113
Ventura, CA 93003
Phone (805) 642-7184
FAX (805) 642-7271

CIRCLE 12 ON READER SERVICE CARD

WELCOME NEWCOMERS

Walkies!

Have you ever met a ham who didn't own a hand-held transceiver? I doubt it. These radios, known as HTs, handie talkies, walkies, handhelds, squawk boxes, and goodness knows what else, are among the most popular playthings in the amateur radio hobby. They permit us to enjoy radio from any location. Thanks to **repeaters** (see below), a tiny walkie can provide communications over great distances, ranging from ten to several hundred miles! Above all, HTs are just plain fun.

Basics

Almost universally, walkies are **FM** rigs, with the clear, crisp audio associated with that form of modulation. They operate in the **VHF** and/or **UHF** bands, the 2 meter VHF band being the most popular. Their transmitters put out between 1 and 5 watts of **RF** energy, which may not sound like much but is very effective for local use, especially in conjunction with repeaters.

The typical HT has **digital memories** which store frequencies and other operating parameters, making operation easy. It has a rechargeable battery good for a few hours of use after each charge. It comes with a "rubber duck," which is a **helically wound**, rubber-encased, flexible antenna. It is fairly small, so you can clip it to your belt or even drop it in your pocket. It has a **DTMF** Touch-Tone™ pad which permits you to send tones over the air for telephone **autopatch** or other control applications. It may include a subaudible tone or **CTCSS** encoder, enabling access to repeaters which require it.

Psst. . . Pass it On

The key to the HTs' popularity is the proliferation of repeaters, which are automated stations designed to receive the handhelds' weak signals and retransmit them with much greater power. These stations, usually strategically located on a hill or tall tower, can often be heard up to 60 or more miles away. Due to their large, well-placed antennas, they can receive signals from nearly as far. A small radio with a **simplex** (direct station-to-station) range of only a few miles has the power and range of the repeater, as long as it can reach the big station.

Who operates repeaters? Some are owned by individuals, but most are run by ham clubs. There are few areas in the United States without at least one repeater, and most towns have several. The **ARRL** publishes a directory listing them all in a thick little book.

Since a repeater transmits and receives at the same time, it must, of course, use different frequencies for the two functions or it would receive its own signal and quickly go to feedback heaven. The difference between the transmit and receive frequencies is called the **offset** or *shift*. Most repeaters on the 2 meter band use a 600 kilohertz offset, while those on the UHF bands use a 5 megahertz offset. On the 1¼ meter (220–225 MHz) band, the offset is 1600 kHz (1.6 MHz).

The transmit frequency may be higher or lower than the receive frequency. A **band plan** specifies **frequency pairs**, and few repeaters deviate from it. The HT, of course, transmits and receives on the same frequencies, but in reverse. Thus the handheld's transmit frequency is the same as the repeater's receive frequency, and vice versa.

Some repeaters provide functions beyond simple retransmission. One of the most popular extras is the autopatch, which allows connection to the landline telephone network. With it, you can make phone calls from any walkie equipped with a DTMF pad. Observation of the rule prohibiting business-oriented transmissions is especially important when using the autopatch. Other functions include voice-synthesized time, date, and signal reports, and even the ability to link multiple repeaters into a network permitting communication over hundreds of miles. Imagine using your handheld to talk with someone three states away while you walk down the street!

Miss Manners

Operating through a repeater requires etiquette altogether different from that used on the HF bands. Instead of calling **CQ**, you say "(your call) listening." Signal reports are given in terms of **quieting**, rather than strength; it's impossible to know the originating station's strength into the repeater because you are listening to the retransmitted signal. A report of "full quieting" means you are coming through with no background hiss, while one of "70 percent quieting" means your signal into the repeater is scratchy.

Because only one station can use the repeater at a time, it is considered very discourteous to tie it up with long monologues. Short, succinct transmissions keep the conversations flowing smoothly and promote acceptance and friendliness toward new users.

Getting Out

HTs are designed to be used on the go, so get out there and have fun. Bring yours along when camping, hiking, walking, or even shopping. And of course, what ham would be caught dead at a hamfest without his trusty walkie?

. . . Michael Jay Geier KB1UM

Glossary

ARRL The American Radio Relay League.

Autopatch A repeater function that permits connection to the landline telephone network.

Band plan A gentlemen's agreement regarding usage of frequencies within the band.

CTCSS Continuous Tone Coded Squelch System. *PL*™, "private line," is Motorola's trademark for CTCSS. Some repeaters use these tones to avoid reception and retransmission of unwanted signals.

CQ ("Seek-you") A CW abbreviation meaning "calling any station."

Digital memories Storage registers in HTs, used to hold frequencies and other operating data, such as offset.

DTMF Dual Tone Multi Frequency. The generic term for the tones produced by a Touch-Tone™ phone. Used for autopatch and repeater control.

FM Frequency modulation. Nearly all walkies, repeaters, and mobile rigs are FM. An FM receiver isn't sensitive to amplitude variations caused by impulse-type noise or fading signals.

Frequency pair The transmit and receive frequencies used by a repeater.

Helically wound Wound in a spiral shape, like the wire in a rubber duck antenna.

Offset The difference between the transmit and receive frequencies, also known as the *shift*.

Quieting The degree to which a received FM signal overcomes the background noise. A full quieting signal is the best possible signal.

Repeater Automated station which simultaneously retransmits signals on a frequency different from the frequency on which they were received.

RF energy Radio frequency energy. The radio wave spectrum begins at 20,000 Hz (cycles per second) and extends to beyond 300 billion Hz.

Rubber duck A flexible rubber-encased antenna with internal helically wound wire.

Simplex Receive and transmit on the same frequency.

UHF Ultra High Frequency. The UHF spectrum ranges from 300 to 3000 MHz. Amateur UHF bands are the 70cm (420–450 MHz), 33cm (902–928 MHz), and 23cm (1240–1300 MHz). 23cm is often considered a microwave band.

VHF Very High Frequency. The VHF spectrum ranges from 30 to 300 MHz. Amateur VHF bands are the 6 meter band (50–54 MHz), the 2 meter (144–148 MHz), and the 1¼ meter (220–225 MHz) bands.

QFP

Editorial Offices
WGE Center
Hancock NH 03449
phone: 603-525-4201

Advertising Offices
WGE Center
Hancock NH 03449
phone: 800-225-5083

Circulation Offices
WGE Center
Hancock NH 03449
phone : 603-525-4201

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon publication. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB" or GEnie address "MAG73") or on disk as an IBM-compatible ASCII file. You can also contact us at the 73 BBS at (603) 525-4438, 300 or 1200 baud, 8 data bits, no parity, one stop bit. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

73 Amateur Radio (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., WGE Center, Forest Road, Hancock, New Hampshire 03449. Entire contents ©1989 by WGE Publishing, Inc. No part of this publication may be reproduced without written permission from the publisher. For Subscription Services write *73 Amateur Radio*, PO Box 58866, Boulder, CO 80322-8866, or call 1-800-289-0388. In CO call 1-303-447-9330. The subscription rate is: one year $24.97; two years $39.97. Additional postage for Canada is $7.00 and for other foreign countries, $19.00 surface and $37.00 airmail per year. All foreign orders must be accompanied by payment is US funds. Second class postage paid at Hancock, New Hampshire and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor, MI 48106. Postmaster: send address changes to *73 Amateur Radio*, PO Box 58866, Boulder, CO 80322-8866.

Contract: Just by reading this, you have entered into a binding legal contract. To avoid being prosecuted under every penalty provided by law, you will spend a minimum of two hours per week on ten meters talking with Novices and encouraging them. No excuses will be accepted. No exceptions. Ask questions—get them to talk—make hamming fun for them. Keep notes—a report will be required.

73 AMATEUR RADIO

DECEMBER 1989 — Issue # 351

TABLE OF CONTENTS

HOME-BREW

9 VOX for HTs
No-hands hand-held hamming. KA8HML

22 Two Meter Mobile Rig
Sick of anemic HT mobile operation? Pep up your handie with this booster. N8KDD

24 Poor Boy Satellite Station
Coat hanger + SO-239 connector = Mode A uplink antenna! N5LKJ

38 Color SSTV for the Atari ST, Part I
Fast and easy way to get on this fascinating mode. WB2OSZ

REVIEWS

18 Yaesu FT-470 2m/70cm HT
Two meters and 70cm in a micro-sized hand-held. KB1UM

25 Breadblox Breadboarding System
The ultimate in flexible circuit experimentation. WB9RRT

29 The ICOM IC-2SAT
ICOM's stylish addition to their pico-sized 2m HT line. KB1UM

32 Ramsey QRP-40 Transmitter
$30 and a few hour's building time gets you out on this popular DX band. WB0E

45 Mirage D15 70cm Amp
Get more bang for the buck with this brick. KT2B

BOOK REVIEWS

26 Communications Satellites—A Monitor's Guide
For those who wanted to know all about these birds, but didn't know where to ask. WA5ZIB

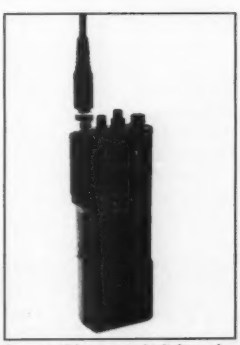
DEPARTMENTS

FEEDBACK... FEEDBACK!

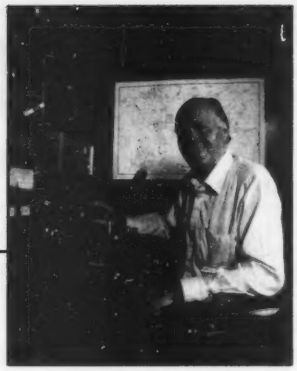
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

66 Above and Beyond
80 Ad Index
72 Ask Kaboom
95 Barter 'n' Buy
70 Circuits
96 de K6MH
80 Dealer Directory
17 Feedback Index
44 Ham Help
17 Ham Profiles
56 Hamsats
50 Homing In
94 Index: 12/89
76 Letters
60 Looking West
4 Never Say Die
74 New Products
47 Packet Talk
86 Propagation
54 QRP
7 QRX
89 73 International
62 Special Events
64 Updates
2 Welcome Newcomers
92 1989 Annual Index

Cover by Alice Scofield
Cover photo by Frank Cordelle
Cover model: Robin Camirand



See page 18 for more on this little wonder.



NEVER SAY DIE

Wayne Green W2NSD/1

How You Can Help Save Amateur Radio!

Here comes that confounded Gloom & Doom Wayne Green again. Sigh. Naw, au contraire, I cometh with solutions, not problems. Good solutions, too. Maybe even fun solutions.

I've always remembered the sign on the Director's door at a research institute where I studied forty years ago. It said, "Bring me solutions, not problems." Chap named L. Ron Hubbard—maybe you've read about him—made billions. It's a good concept.

Alas, before we plunge into the solutions, I should at least give some hints as to the problems. The bottom line problem is that we've had pitiful little growth in the last 25 years and, so far, no visible prospects for much more. We're watching our fellow old timers running our ham clubs and tottering around with their walkers at hamfests, muttering to themselves.

I've heard all the rationalizations (which I'm sure you passionately believe) for why we aren't attracting youngsters any more. It's the code. Kids have too many other interests today. They're too lazy. They're all into computers. Yep, all those things are true, but they're just excuses, they're really not the main problem.

W6NKE, in a letter in the *QCWA Journal*, said it. If we want to attract youngsters (or anyone, for that matter), hamming has to be fun. One only has to listen to the bands today to realize that operating isn't much fun anymore. Between DX pileups, where we have massive proof that intentional interference is alive and well, DX jamming, net jamming, repeater jamming and language which wouldn't even have been considered possible 25 years ago, if you want to interest someone in amateur radio you'd better not let them listen to our bands.

It won't be easy, but I believe we can fix the mess we've allowed to happen. As a matter of fact, it'll be fun fixing it. I think we can clean it all up—yes, even the DX pileups.

Okay, let's suppose we're actually able to clean up the garbage on our bands. Then where are we? Then we're left with the same old banal signal report contacts which have been amateur radio's quagmire ever since the hobby started. No, we've not only got to clean up our garbage, we're going to have to do it ourselves, without asking or expecting any help from the FCC, the ARRL or any other bureaucrats, and then we're going to have to set about making ham contacts actually interesting. Wow, what a concept! I believe we can do all this—and it'll be fun. You'll see. Now stop being a curmudgeon and see what I'm going to propose. Yes, I already can hear the whining arguments that it won't work. Baloney.

A couple years ago the gullible were convinced that the Novice Enhancement program was going to save amateur radio. Spoilsport Green said no, it won't. Now it's the no-code malarky. I don't care whether you are in favor of a no-code license or not, the present ARRL proposition is a hoax. It's a safe way to be in "favor" of no-code, all the while burning it at the stake. All the fire and fury will distract the membership from actually thinking, seems to be the theory. Good theory.

As I pointed out in my recent talk at the Huntsville hamfest, no-code today is a religious matter. It's something about which you have no facts, and that you believe in passionately. That's religion and we kill people who disagree with us on religious matters. Oddly enough, we don't seem as anxious to kill people over facts.

The proposed no-code salvation for American amateur radio meets the requirements for being a duck. It looks like the Canadian no-code license, smells like it, walks like it, sounds like it. . . by golly, it *is* a duck! The Canadians, for those of you who have been

continued on p. 82

CQ's Dastardly Attack on the ARRL

The amateur radio community was shaken to its foundations by the recent vicious and unprovoked attack by *CQ Magazine* (October 1989) against the ARRL. Tsk.

The *CQ* editorial took The League to task for wasting some $600,000 or so on their new W1AW hamshack. Worse, instead of using ham gear, which they probably could have had for free, they spent top dollar buying commercial communications equipment.

What do we have to do, form a committee to stop these political attacks on The League? Obviously the *CQ* editors, motivated by greed, are trying to destroy our beloved ARRL. As an ARRL member with a 50-year pin proving beyond any question my total devotion to this great organization, perhaps I should head such a committee. Do I hear from any volunteers to start local chapters?

In the meanwhile I hope you will flood the *CQ* editors with letters expressing your revulsion and disgust at their sorry, bumbling attempt at sowing discord and distrust among true-blue ARRL stalwarts.

Heck, I say that if The League's directors don't think the Kenwood, ICOM, Yaesu and Ten-Tec gear is good enough for their paid commercial ham operators to use, I think we should respect their decision. Who would possibly know better than the ARRL and *QST* what equipment is best for a top-notch ham station?

STAFF

PUBLISHER/EDITOR
Wayne Green W2NSD/1

ASSOCIATE PUBLISHER
Jim Morrissett K6MH

EDITOR IN CHIEF
Bryan Hastings NS1B

MANAGING EDITOR
Hope Currier

SENIOR EDITOR
Linda Reneau KA1UKM

INTERNATIONAL EDITOR
Arnie Johnson N1BAC

EDITORIAL ASSISTANT
Joyce Sawtelle

ART DIRECTOR
Alice Scofield

JAPANESE TRANSLATOR
David Cowhig WA1LBP

ASSOCIATES/TECH ADVISORY COMMITTEE
Mike Bryce WB8VGE
Michael Geier KB1UM
Jim Gray W1XU
Chuck Houghton WB6IGP
Dr. Marc Leavey WA3AJR
Andy MacAllister WA5ZIB
Joe Moell KØOV
Bill Pasternak WA6ITF
Arliss Thompson W7XU

ADVERTISING
1-603-525-4201
1-800-225-5083

SALES MANAGER
Ed Verbin

ADVERTISING SALES
Jim Bail KA1TGA

ADVERTISING SALES COORDINATOR
Lisa Niemela

MARKETING ASSISTANT
Donna DiRusso

WGE PUBLISHING, INC.

CHIEF FINANCIAL OFFICER
Tim Pelkey

CIRCULATION DIRECTOR
Rodney Bell

CIRCULATION ASSISTANT
Janet LaFountaine

TYPESETTING/PAGINATION
Susan Allen, Linda Drew, Ruth Benedict

GRAPHICS SERVICES
Dale Williams, Peri Adams

GRAPHICS PHOTOGRAPHER
Dan Croteau

Editorial Offices
WGE Center
Forest Road, Hancock NH 03449
603-525-4201
Subscription Customer Service
1-800-525-0643
Colorado/Foreign Subscribers
call 1-303-447-9330

Wayne Green Enterprises is a division of International Data Group.

Reprints: The first copy of an article—$3.00 (each additional copy—$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Forest Road, Hancock, NH 03449.

KENWOOD

Stacked in your favor!

TM-231A/ 331A/431A/531A

FM Mobile Transceiver

Looking for a compact transceiver for your mobile VHF and UHF operations? KENWOOD has a compact rig for each of the most popular VHF/ UHF bands.

- 20 multi-function memory channels.
- High performance,– high power! 50W (TM-231A), 35W (TM-431A) with a 3 position power switch.
- Optional full-function remote controller (RC-20). A full-function remote controller can be mounted in any convenient location. Using the IF-20 interface the RC-20 may be connected to four mobile transceivers. (TM-231A/ 431A/531A or the TM-701A).
- Multi-function microphone supplied. Various controls are provided on the mic. for increased utility.
- Auto repeater offset on 144 and 220 MHz.
- Built-in digital VFO allows selection of the frequency step. (5, 10, 15, 20, 12.5, 25kHz; TM-531A: 10, 20, 12.5, 25kHz.)
- Selectable CTCSS tone built-in.
- Tone alert system – for true "quiet monitoring"! When enabled this function will activate a tone when squelch opens.
- DRS (Digital recording system). The optional DRU-1 can store received and transmitted messages for up to 32 seconds, allowing the operator to check or return any call using the tone alert system.
- Automatic lock tuning function (TM-531A).
- Repeater reverse switch.

TM-231A
136-174 MHz receive.
TX on Amateur bands only.
Modifiable for MARS/CAP.
Permit required.

Optional Accessories:
• **RC-20** Full-function remote controller • **RC-10** Handset • **IF-20** Interface unit handset • **DRU-1** Digital recording unit • **MC-44** Multi-function hand mic. • **MC-44DM** Multi-function hand mic. with auto-patch • **MC-48B** 16-key DTMF hand mic. • **MC-55** 8-pin mobile mic. • **MC-60A/80/85** Desktop mics. • **MA-700** Dual band (2m/ 70cm) mobile antenna (mount not supplied) • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **PS-430** Power supply • **MB-201** Mobile mount • **PG-2N** Power cable • **PG-3B** DC line noise filter • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **TSU-6** CTCSS unit

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD
pacesetter in Amateur Radio

KENWOOD

TS-950SD

"DX-clusive" HF Transceiver

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

The Ultimate Signal.

• **Dual Frequency Receive Function.** The TS-950SD can receive two frequencies simultaneously. The sub-receiver has independent controls for frequency step size, noise blanker, and AF gain and its own digital display!

• **New! Digital AF filter.** Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.

• **New high voltage final amplifier.** 50 V power transistors in the 150-watt final section, results in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.

• **New! Built-in microprocessor controlled automatic antenna tuner.** The new antenna tuner is faster and you can store the settings in memory! (Manual override is also possible.)

• **Outstanding general coverage receiver performance and sensitivity.** Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides from 100 kHz to 30 MHz. The intermodulation dynamic range is 105 dB.

• **Digital Signal Processor.** DSP is a state-of-the-art technique that maximizes your transmitted RF energy. Your signal stands out because it is much more pure than your competition! You can even tailor your transmitted CW or voice signal waveshape!

• **High performance IF filters built-in.** Select various filter combinations from the front panel. For CW: 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!

• **Multi-Drive Band Pass Filter (BPF) circuitry.** Fifteen band pass filters are available in the front end to enhance performance.

• **Famous Kenwood interference reduction circuits.** SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

• **Built-in TCXO for highest stability.**

• **Built-in electronic keyer circuit.**

• **100 memory channels.** Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.

• **Digital bar meter.**

Additional Features: Built-in interface for computer control • Programmable tone encoder • Optional VS-2 voice synthesizer • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD
pacesetter in Amateur Radio

Optional Accessories: VS-2 Voice synthesizer • SP-950 External speaker w/AF filter • SM-230 Station monitor w/pan display • SW-2100 SWR/power meter • TL-922A Linear amplifier (not for QSK)

Specifications, features and prices subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

QRX . . .

EDITED BY BRYAN HASTINGS NS1B

Smile for the Camera!

Have any color ham radio related photos—ham clubs, humor, etc.? Give'em world-wide exposure in the QRX column, one of *73*'s hottest departments. Any reasonable submissions stand a good chance of appearing here in the near future. No polaroids, please; we need prints from 35mm or better film. Make sure to send them to the attention of QRX.

Ham License Fees

The US House of Representatives passed and sent on to the Senate the 1989 federal deficit reduction bill that includes a $30 fee for amateur radio licenses. The Senate is expected to act quickly on the measure and then send it along to President George Bush for his signature. Stay tuned for a full report.

UK Novice

The Radio Society of Great Britain (RSGB) proposed a pair of new entry level Novice class licenses for the UK. "Novice B" would be a code-free certificate with VHF voice privileges above 30 MHz. Passing a five wpm code test, to receive the "Novice A" ticket, adds phone privileges on 160 meters.

If the British Department of Trade and Industry gives its nod to the RSGB proposal, the applicant will have to take a 30-hour training course, given by a DTI-approved instructor. The RSGB says this would replace the Morse code test as a method of assuring the proper standards in the British Amateur Service. These licensees would be granted many emission modes applicable to the bands and band segments assigned to the current license class, but at a maximum power of only five watts. There would be no minimum age to get either ticket and both would carry a three-year renewable license term.

The RSGB says this proposal is based on a survey of its members up to age 25. They add that a Novice ticket is needed to help offset the severe shortage of skilled electronics technicians and engineers in the UK. The UK has a no-code license, but it requires an extremely high level of skill to obtain.

If the DTI approves the RSGB Novice proposal, the UK will be second only to Japan in its liberalization of amateur licensing using no-code as an entry point.

PRB-1 Wins in Costa Mesa

Hams in this California city have something to cheer about: a new antenna ordinance that gives them a lot more then they expected.

For many years, the Costa Mesa city government told permission-seeking hams to put up whatever system they wanted. Several years ago, however, the city suddenly enacted a 30' maximum height ordinance. When the city decided that it was time to change the variance requirement, Fried Heyn WA6WZO appointed Art Goddard W6XD to promote a drive for a less restrictive ordinance. Goddard organized a mass turnout of hams to a Costa Mesa City Council meeting that lasted until 2 a.m. That motion was passed, and the Council also enacted a second motion that held off enforcement of any antenna ordinances against hams until there was one mutually agreed-upon by the City and the resident amateurs.

Heyn supplied to the Council, in September '88, PRB-1 material from attorney Wayne Overbeck N6NB and an emergency communications news story about Costa Mesa resident Gordon West WB6NOA. This led to a second City Council meeting. The Costa Mesa City Attorney felt that the terms of PRB-1 took precedence over anything the city might want. As a result, Costa Mesa agreed that its current ordinance was not within federal pre-emption guidelines. Heyn, Overbeck and Goddard met with local hams and city planners to work up an ordinance acceptable to both.

In mid-August, that proposal went before the City Council which passed it with little discussion. It calls for a maximum antenna height without variance of seven feet, grandfathering of all existing towers and antennas as long as they are registered with the city before May 1990 and exclusion of any antenna weighing 80 pounds or less. The city even took the unusual step of writing to each ham living in Costa Mesa detailing the new and more liberal ordinance!

Pirate Taxi Dispatches

The New York City FCC office asks the help of area hams to rid the 10m amateur band of illegal taxicab dispatch services. Hams in the Northeast have been outraged by the indifference of the NYC FCC office to this problem. The illegals even threatened one ham's life.

Kevin McKeon, Engineer in charge of the NYC Field Operations Bureau, inspected many cabs in May and June, which led to the closing down of some illegal dispatch stations. The problem is far from licked, though, and the FCC asks for your help. If you have any info on the illegal operators' identities, their hours of operation, their locations, addresses and/or vehicle license numbers, please send it to the **NYC FCC, 201 Varick Street, New York, NY, 10014.**

Harrison Indicted

An Oceanside, New York ham faces a possible maximum sentence of 250 years in jail and 12.5 million dollar fine if convicted on all 50 counts of alleged mail fraud. Michael D. Harrison WB2PTI was indicted by a Grand Jury of the US District Court on charges of mail fraud. The indictment states Harrison placed full-page ads in amateur radio journals claiming that the long defunct Atlas Electronics had joined forces with Uniden to bring out the very popular HR-2510 10m mobile rig. The ad indicated that Atlas operated out of a post office box in Lynbrook, NewYork and offered the transceiver for only $220. The government says that Harrison never delivered the promised radios even though he received a substantial number of prepaid orders, including one for over $3,000. On 26 January, Harrison was arrested and charged with mail fraud. He was released after posting a $25,000 bond. No trial date has yet been set and prosecutors say that the full dollar amount of the alleged swindle may never be known.

Court Appeal to Save 220–222 MHz

The ARRL went to court to stop the reallocation of the lower 40% of the 1¼m band to commercial service. League Counsel Chris Imlay N3AKD filed the petition to review the FCC reallocation order, in joint cooperation with a second Washington law firm that specializes in these matters. The petition demands that the US Court of Appeals for Washington DC set aside the reallocation of 220–222 MHz over to Land Mobile services and then to remand the matter to the FCC for re-disposition. In its filing, the League claims the reallocation action was arbitrary, capricious, and an abuse of discretion. Case number 89-1602 has been assigned by the court.

Ham Wins Grammy

The National Academy of Recording Artists and Sciences recently honored Larnell "Stu" Harris WD4LZC, of Louisville, Kentucky, for the best male performance by a gospel singer. Harris received his award at the 31st annual Grammy Awards Ceremony in Los Angeles.

Big Thanks

. . . to *Westlink Report*, David Black KB4KCH, and Roy Neal K6DUE, for furnishing this month's news items. Keep your ham radio-related news items and photos rolling in to *73 Magazine*, WGE Center, Forest Rd., Hancock NH 03449, Attn: QRX. You may also submit text as E-Mail to the Sysop on the the 73 BBS, (603) 525-4438, 300/1200 baud, 8 data bits, no parity, and one stop bit.

Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.

$595.00 each
$59.95 DTMF module
$149.95 Digital CTCSS module

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

Now available with Digital CTCSS

COMMUNICATIONS SPECIALISTS, INC.
426 West Taft Avenue • Orange, CA 92665-4296
Local (714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. 1-800-854-0547

VISA

CIRCLE 10 ON READER SERVICE CARD

VOX for HTs

VOX circuit for the IC-2AT and other HTs.

by Thomas E. Warfel KA8HML

The classic ICOM 2AT is the "VW bug" of amateur radio: It's reasonably priced, rugged, and reliable. Unfortunately, there have been no commercial VOX units for it. This article presents a small, low-power VOX circuit for an ICOM 2AT, or just about any other handie-talkie, which you can build using standard surface-mount components.

Circuit Overview

To minimize power consumption, I used a Texas Instruments TLC1079 IC, a quad low-power, low-voltage op amp. Each op amp forms the core of one of four sub-circuits that together make up the VOX. One acts as a buffer to reduce the combined load of the VOX and radio on the microphone, while the other three form the actual voice-detect/switching circuit. See Figure 1.

IC-1B isolates the microphone from the radio. This way, when the transmitter engages, it doesn't change the load at the audio input to the VOX. Note that C4 acts to remove the DC bias from the output signal being fed to the radio. This is important because, while the AC component carries the audio, it is the DC component (switched by Q1) that actually switches the transmitter on and off.

The remaining three op-amps are used only to detect the presence of speech, not to pass speech faithfully. The first VOX stage is an audio filter designed to pass frequencies from about 100 Hz to 800 Hz while providing a net gain of around 50. This is adequate to amplify speech while reducing the likelihood of picking up stray audio noise.

The second VOX stage is little more than a comparator. When the incoming signal (the sum of the DC virtual ground plus the AC amplified/filtered audio signal) exceeds the DC threshold set by R10, R12, and R13, the output of IC-1D goes high. This threshold level, the VOX sensitivity, is adjusted by potentiometer R12 and stabilized by C10. Not all speech sounds will be loud enough to exceed the threshold; maybe only twenty percent or so will cause triggering.

The third VOX stage is needed to "prolong" the pulses from the second VOX stage so that the transmitter stays on, rather than just pulsing on and off. R16 adjusts how long the VOX stays on per triggering. The ICOM 2AT is keyed by pulling the microphone line low through Q1.

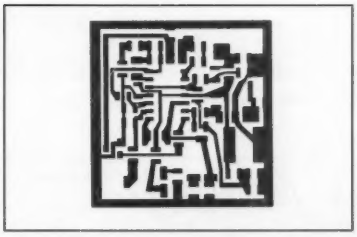


Figure 1. 1:1 printed circuit board etch-resist pattern.

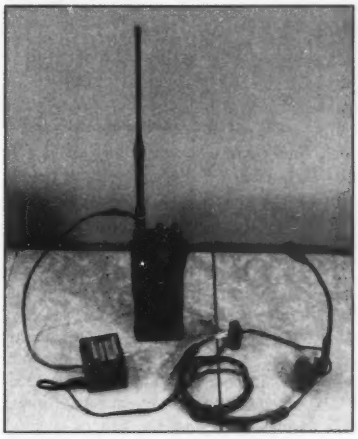


Photo A. How the author mounted the VOX with switch and battery. The "belt clip" is formed from two press-on cable guides.

Constructing the Circuit

The IC is a static-sensitive device, so use a grounded iron if possible. Since the components are small and the circuit traces even smaller, a low-wattage iron generates more than enough heat for these purposes. Unless it's temperature-regulated, anything over 30 watts is likely to lift traces off the circuit board.

Most of the challenge of building with surface mount components is putting the devices where you want them. You *will* need a free-standing magnifying glass (or some other kind of hands-free magnifier), clean tweezers, small diameter rosin core solder, and thin "desoldering" copper braid. Avoid vacuum-type desoldering tools; they tend to suck up components as well as solder. Taping down the corners of the circuit board makes soldering much easier.

Solder the parts directly; don't glue them down first. Tin the copper foil pads, gently position the component on the board with your tweezers in one hand, and touch the tip of the iron to the pad with your other hand. When soldering the IC, use as little heat (and solder) as possible, and wait at least ten to twenty seconds between soldering each pin. The "D" SOIC (Small Outline Integrated Circuit) package is smaller than a normal IC, so the heat dissipation is less than a normal IC as well.

Assembling the Circuit

Go slow when soldering the parts on the board. It takes me about three hours to assemble one board; allow twice as much time if you're new to surface-mount technique. Refer to Figure 3 for parts placement.

Follow this sequence for smooth assembly:

1. Install the two jumpers J1 and J2.
2. C1, C12, C16 (100 pF). Make sure C16 is not bridging any adjacent circuit traces.
3. C15 (1000 pF).
4. C2, C4, C6 (0.1 µF).
5. C3, C13 (220 pF).
6. R1 (5.6k); R4, R5 (100k); R6, R14 (1 M).
7. Diode D1—use voltmeter to verify device polarity!
8. C5 (10 µF to 30 µF). Note that the end with the white band is toward the center of the board, not the edge.
9. R2 (1k); R3 (2.2k).
10. If you haven't done so yet, take a break!
11. R15 (1 M); C11 (.47 µF)—white band points inward; R10 (2.2 M); R17 (100k).

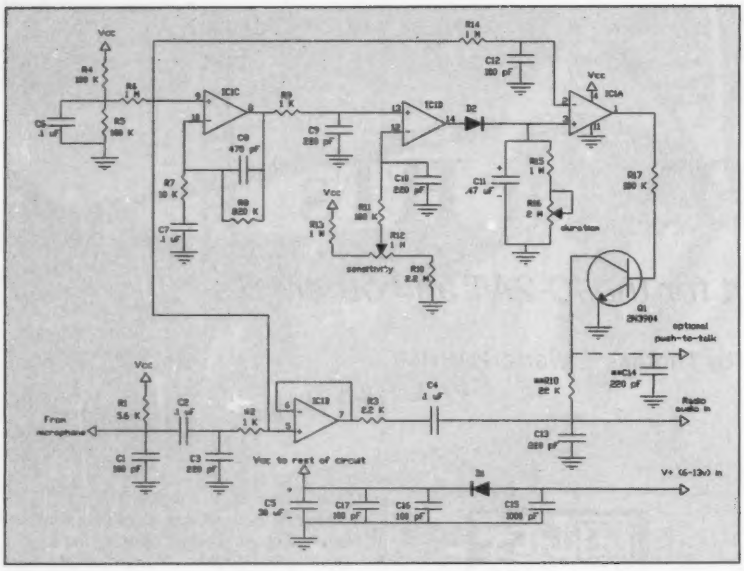


Figure 2. Schematic for the VOX unit.

12. R16 (2 M potentiometer).
13. IC-1. Note that one side of the IC is beveled. That side should face the half of the board just completed.
14. R13 (1 M); R11 (100k).
15. R12 (1 M potentiometer).
16. Deflux the board now if you have flux remover. Don't scrub with a wire brush, just rinse the board with solvent.
17. Diode D2. Again, be sure of your polarity.
18. C17 (100 pf). This is probably the most difficult component to install without shorting adjacent traces.
19. Take another break.
20. C10, C9 (220 pF).
21. Q1.
22. R9 (1k), C7 (0.1 µF).
23. R8 (820k), C8 (470 pF), R7 (10k).

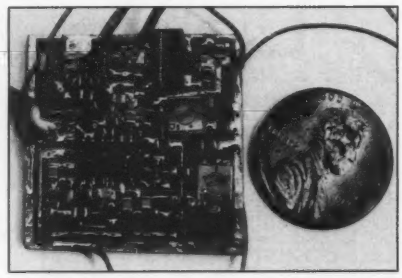


Photo B. The VOX unit measures only 1.2" x 1.0" x 0.2".

If you are assembling this to use with an ICOM 2AT or a similar rig in which the microphone line doubles as a push-to-talk (PTT) line, install R18 (22k), deflux the board, and go to the testing section.

If you are assembling this to use with a rig that requires a separate PTT line, do NOT install R18. Instead, install C14 (220 pF), deflux the board, and go to the testing section.

If you need to drive a relay with this circuit, install C14. Connect one side of the relay coil to the "optional-push-to-talk" pad, the other to the V+ pad. Connect a 1N914 diode across the relay coil, as shown in Figure 4. Deflux the board.

Circuit Testing

1. Tack-solder a 9V snap-type battery clip to the board with the positive (red) lead going to the V+ pad and the negative (black) lead going to the ground pad. Connect one terminal of a 9 volt battery to one of the snap buttons, but leave the second terminal unconnected. You will probably have to rotate the battery around the first snap to do this. With a milliammeter, complete the circuit between the free battery terminal and snap-on clip. The circuit should read between 50 and 100 microamps (0.05 mA to 0.1 mA). If the current reads less than this (or even zero), check to make sure that the battery is good, that there is battery voltage between the V+ pad and the ground pad (faulty battery clip), or whether D1 is in backwards. If the current reads much more than this, see if C17 is shorting the power lines, or if C5 and/or C11 are wired in backwards.
2. Assuming correct current, fully connect the battery terminal to the clip. Measure the voltage between ground and the junction of R4, R5, and C6. It should be between 3 and 5 volts. If lower, check to make sure the battery is good, and that D1 and C5 are well-soldered and making good electrical connections. Also see if either R5 or C6 are shorting the pad to ground. If the voltage is greater than 5 volts, check to see if resistor R6 is shorting out on the Vcc trace, or if R4 is shorted out.
3. Assuming that the R4, R5, and C6 junction pad voltage was acceptable, turn potentiometer R12 completely counter-clockwise. Measure the voltage on IC-1 pin 14 relative to ground. It should be at or near 0 volts. If the voltage, however, is at or near Vcc, measure the voltage at pin 13. If pin 13 is at 0 volts, check R13, R12, and R11.
4. Assuming pin 14 checked out, turn R12 completely counter-clockwise. Check the voltage on pin 14 again; if it is now at Vcc, back R12 clockwise again until the voltage on pin 14 goes back to zero. Disconnect the battery, and tack-solder microphone leads between the "to headset microphone" pad and ground. Lead polarity is important.
5. Reconnect the battery to just one snap, and measure the current as in step 2. It should now be between 0.3 mA and 0.5 mA.

   If the current is lower than this, check to make sure the microphone leads are correctly connected, and that R1 is properly installed.
6. Assuming proper circuit current, fully connect the battery. With a voltmeter, measure the voltage on pin 14. If it is above Vcc/2, quietly turn R12 clockwise until it goes back to zero.
7. Tap the microphone. With each tap, the voltage on pin 14 should briefly spike up to Vcc. If there is no change at pin 14, test with a small amplifier/speaker in series with a 100 µF capacitor as follows: Connect the capacitor negative lead to circuit ground. Connect the capacitor positive lead to one of the amplifier leads. Connect the other amplifier lead to IC-1 pin 8. Tap the microphone. If you don't hear any noise from the speaker, there is a problem with the circuitry for op amp IC-1C. If you do hear noise, check the circuitry for op amp IC-1D.
8. Assuming pin 14 is responding correctly, connect the voltmeter between pin 3 and ground. Again, tap the microphone. With each tap, the voltage should spike up to at least Vcc/2, then slowly decay back to 0. If there is no spike, check the polarity of diode D2.
9. Rotate R16 completely counter-clockwise. Connect the voltmeter between pin 1 of IC-1 and ground. Tap the microphone. With each tap, the voltage should briefly spike. Rotate R16 completely clockwise. Tap the microphone. The voltage should spike, but then stay high for a moment before dropping. If the voltage at pin 1 is always high, check to see if C12 may be shorting pin 2 to ground. If the voltage is zero, check to see if C11 and R14 are correctly installed.
10. Rotate R16 completely counter-clockwise. Speak into the microphone. Adjust R12 so that pin 1 bounces high when you speak in a moderately loud voice but does not go high when you breathe. Once R12 is adjusted, starting speaking continuous-

INTRODUCING OUR NEW COMPUTER-CONTROLLED

REP-200 REPEATER

If you always thought a computer-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

As always, Hamtronics strives to give *superb performance* at *modest cost!* In this case, a premium repeater with versatile computer control, autopatch, and many dtmf control features at *less than many charge for a bare-bones repeater!*

We don't skimp on rf modules, either! Check the features on R144 Receiver, for instance. GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

We completely re-thought the whole idea of what a repeater should be, to give the *best features* at the *lowest cost*.

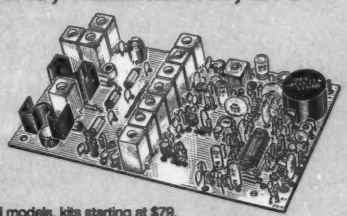
ONLY $1295!

- Available for the 10M, 6M, 2M, 220MHz, 440MHz, 902MHz ham bands. *FCC type accepted models also available for vhf and uhf commercial bands.*
- **Rugged exciter and PA**, designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
- **Five courtesy beep types**, including a pleasant multi-tone sequence.
- **AUTOPATCH:** either **open or closed** access, **toll-call restrict**, auto-disconnect.
- **Reverse Autopatch**, two types: auto-answer or ring tone on the air.
- **DTMF CONTROL:** over 45 functions can be controlled by touch-tone. Separate 4-digit control code for each function, plus extra **4-digit owner password.**
- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts for covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**

There are many other features, too numerous to mention. Request catalog for full details.

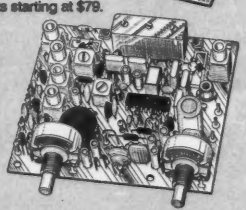
HIGH PERFORMANCE XMTRS & RCVRS FOR REPEATERS, AF & DIGITAL LINKS, TELEMETRY, ETC.

FM EXCITERS: kits $99, w/t $169. 2W continuous duty. TCXO & xtal oven options available. *FCC type accepted for com'l uhf & hi bands.*

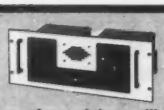


- **TA51** for 10M, 6M, 2M, 150-174, 220MHz.
- **TA451** for uhf.
- **TA901** for 902-928MHz, 0.5W out (w/t only, $169).
- **VHF & UHF AMPLIFIERS.** For fm, ssb, atv. Output from 10W to 100W. Several models, kits starting at $79.

FM RECEIVERS: kits $139, w/t $189.



- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR,** similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 10M, 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **Weather satellite & AM aircraft rcvrs** also available.



If you prefer a plain-vanilla or kit repeater, you couldn't find a better value than our original

REP-100 REPEATER

Same fine rf modules as REP-200 but with COR-4 Controller. Can add autopatch, dtmf decoder, CTCSS, either now or later. Kit only $575, w/t $975.

ACCESSORIES

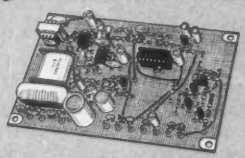
COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... $59

***NEW* COR-4** kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call .. $99

***NEW* TD-3 SUBAUDIBLE TONE DECODER/ENCODER** kit. Adjustable for any tone. Designed **especially** for **repeaters**, with remote control activate/deactivate provisions $24

TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! $79



AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std . $79

AP-2 SIMPLEX AUTOPATCH Timing Board kit. Use with above for simplex operation using a transceiver $39

MO-202 FSK DATA MODULATOR kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. $39

DE-202 FSK DEMODULATOR kit. For receive end of link. $39

9600 BAUD DIGITAL RF LINKS. Low-cost packet networking system, consisting of new MO-96 Modem and special versions of our 220 or 450 mHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W. *Call for more info on the right system for your application!*

GaAs FET PREAMPS

at a fraction of the cost of comparable units!

LNG-(*)

***ONLY* $59** wired/tested

FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 28-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 803-960 MHz.*

LNW-(*)

MINIATURE GaAs FET PREAMP

***ONLY* $24/kit, $39** wired/tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-160, 150-200, 200-270, or 400-500 MHz.*

LNS-(*)

IN-LINE PREAMP

***ONLY* $79/kit, $99** wired/tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Specify tuning range: 120-175, 200-240, or 400-500 MHz.*

HELICAL RESONATOR PREAMPS

Preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRA-(*), $49 vhf, $94 uhf.**

**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-450, 450-470.*

RECEIVING CONVERTERS

Low noise converters to **receive vhf and uhf bands on a 10M receiver.** Choice of kit with case & BNC jacks, kit with pcb only, or w/t unit in a case. Other models available for other in/out ranges & atv. *Request catalog for complete listings.*

VHF input ranges avail: 136-138, 144-148, 145-147, 146-148, 220-222, 222-224; kit less case $39, kit w/case $59, w/t in case $89.

UHF input ranges avail: 432-434, 435-437; kit less case $49, kit w/case $69, w/t in case $99.

902-928 MHz converts down to 422-448 or 430-450 range. Same price as uhf.

TRANSMITTING CONVERTERS

XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 6M, 2M, 220, 432, 435, and for atv. 1W output. **Kit only $79.** PA's up to 45W available. *Request catalog for complete listings.*

- For complete info, call or write for FREE 40-page catalog.
  Send $2 for overseas air mail. For casual interest, check reader service; allow 3-4 weeks.
- Order by mail, fax, or phone (answering machine off hrs).
- Min. $3 S&H charge for first pound plus add'l weight & ins.
- Use VISA, Mastercard, check, or UPS C.O.D. ($3 fee).

OUR 27TH YEAR!

hamtronics, inc.

65 MOUL RD. - HILTON NY 14468-9535

Phone: 716-392-9430 -- FAX: 716-392-9420

Hamtronics is a registered trademark. Copyright 1995, Hamtronics, Inc. All rights reserved.

CIRCLE 5 ON READER SERVICE CARD

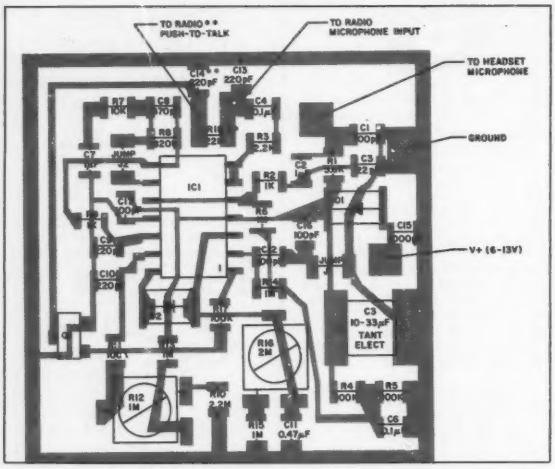


Figure 3. Parts placement diagram.

ly. Slowly rotate R16 clockwise until the pin 1 stops bouncing and just stays high. Stop speaking and verify that pin 1 goes low again. The VOX circuit assembly is now complete.

Installation and Use

There are times when a headset/PTT arrangement may be more appropriate than VOX. I wired my VOX unit with a 3-way toggle switch, an Augat Alcoswitch CST-023TA, to easily switch between the two. Center is off, one side is momentary PTT, and the other side is VOX.

I used a DP3T instead of a DPDT-center off to avoid keying the transmitter when turning the VOX off. Merely turning off circuit power essentially turns the microphone off. This generates electrical noise which is picked up by the VOX as if it were a sound spoken by a person. As the circuit consumes so little power, the residual charge left on C5 (the despiking capacitor) can easily switch the transmitter on for a moment. Ideally, one would solve this problem by using a resistor/capacitor combination to buffer microphone power separately from circuit power. In this way microphone power would stay on just a bit longer than circuit power when the unit is turned off, thereby avoiding the "noise." Unfortunately, this would require around a 220 µF capacitor, which is larger than the rest of the circuit! With a DP3T switch, you can instantly quiet the circuit by draining C5 as soon as you disconnect power. See Figure 5 for details.

I mounted the entire assembly (VOX, switch, 9 volt alkaline battery, jack for the HS-10 headset) in a 3.75″ x 1.25″ x 2″ blue plastic Unibox and added a belt-clip. The circuit itself takes very little space; it's the battery, wires, switch, and headphone jack that take up the room.

Other Radios

You can use this same VOX circuit with other handi-talkies with only minor alterations. Yaesu HTs have the same type of PTT detections as the ICOM and can work unmodified.

Kenwood HTs have a slightly different means of detecting a PTT condition with their external microphone. To use this circuit with a Kenwood HT, install VOX component C14 instead of R18, and then wire the "To-radio-push-to-talk" pad to the Kenwood PTT line (microphone jack "ground") and the "to-radio-microphone-input" pad to the radio microphone-input line. The VOX circuit ground must then connect to the external speaker ack ground (and not to the external microphone jack "ground" connector).

Conclusion

The final circuit is roughly 1.2″ by 1″ wide, draws less than 0.5 mA, and is relatively resistant to ambient RF. Total cost of parts and mounting, excluding the headset, is around $40. Circuit boards and parts kits are available through the Carnegie-Mellon Amateur Radio Club. Send an SASE to Tom Warfel, CMUARC, 414 South Craig St. #176, Pittsburgh PA 15213. 73

Thomas E. Warfel, licensed as a Novice in the late '70s, currently holds an Advanced license. He graduated cum laude in Electrical Engineering in 1988, and is now in his second year as a medical student. His address is 120 Ruskin Ave., #603, Pittsburgh PA 15213.

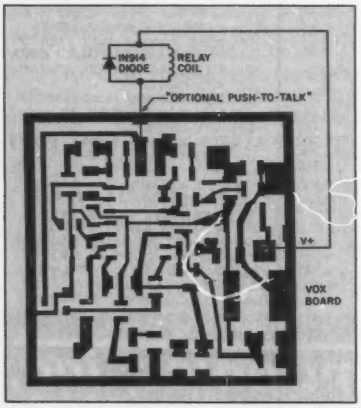


Figure 4. Connecting a relay to the VOX board.

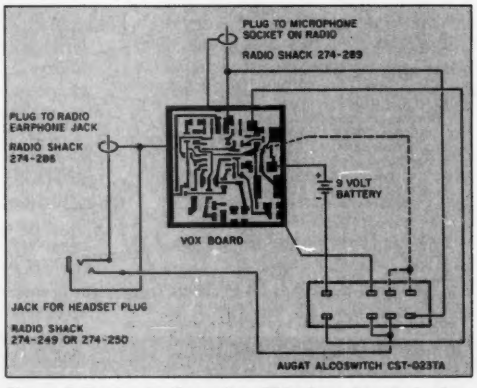


Figure 5. Putting it all together. This shows how I wired my VOX to my ICOM 2AT so that by throwing the switch in one direction, I had VOX, center was off, and the other direction was a momentary PTT.

Parts List for the 2M VOX

Component	Value	Supplier/Part ID	Each	Total
R2, R9	1k	Garrett MCR10JW102	0.14	0.28
R3	2.2k	Garrett MCR10JW222	0.14	0.14
R1	5.6k	Garrett MCR10JW562	0.14	0.14
R7	10k	Garrett MCR10JW103	0.14	0.14
R18	22k	Garrett MCR10JW223	0.14	0.14
R4,R5,R11,R17	100k	Garrett MCR10JW104	0.14	0.56
R8	820k	Garrett MCR10JW824	0.14	0.56
R6,R13,R14,R15	1 M	Garrett MCR10JW105	0.14	0.56
R12	1 M pot.	Garrett G4E105M	1.98	1.98
R16	2 M pot.	Garrett G4E205M	1.98	1.98
R10	2.2 M	Garrett MCR10JW225	0.14	0.14
J1,J2	0Ω	Garrett MCR18JW000	0.08	0.16
C1,C12,C16,C17	100 pF	Garrett 0805N101J101	0.28	1.12
C3,C4,C10,C13,C14	220 pF	Garrett 0805N221J101	0.30	1.50
C8	470 pF	Garrett 0805N471J101	0.30	0.30
C15	1000 pF	Garrett 0805N102J101	0.35	0.35
C21,C4,C6, C7	0.1 µF	Garrett 08052104M500	0.25	1.00
C11	0.47 µF	Garrett 1812B474K500	1.25	1.25
C5	33 µF	Garrett 267M1602336M	1.68	1.68
Q1	2N3904	Garrett MMST3904	0.30	0.30
D1,D2	1N4148	Garrett RLS4148	0.15	0.30
IC-1	TLC1079ID	Marshall Industries	7.25	7.25
DP3T	momentary	Augat Alcoswitch CST-023TA	2.50	
PC board, battery clip, mounting case, headset jack, radio plugs, wire				12.00

Parts Suppliers

Garrett IEU, Inc.
3130 Skyway Dr., #104
Santa Maria CA 93455
(805) 922-0594

Marshall Industries
in Pittsburgh PA
(412) 788-0441

Augat/Alcoswitch
(call for local distributor)
1551 Osgood Street
North Andover MA 01845
(508) 685-4371

Meadowlake Corporation
PO Box 497
Northport NY 11768

Go First Class on GAP Airwaves with the CHALLENGER DX-V or New CHALLENGER DX-VI

Unique Multiband Antennas that Utilize the Patented GAP Elevated Launch Technology

The Revolution in Antenna Design

That . . .

- Launches RF from an elevated GAP
- Eliminates earth loss
- Comes pre-tuned, No adjustments necessary
- Uses 3 short radials @ 25 feet
- Assembles in less than 30 minutes
- Is self supporting w/drop in ground mount and is 31 feet high

but has NO!!!

- Traps
- Coils
- Transformers
- Baluns
- Resistors
- or Base Insulators

Challenger DX-V $199*

Total bandwidth on
40, 20, 15, 10 meters
80 KHz on 80 meters

Challenger DX-VI $219*

Total bandwidth on
40, 20, 15, 12, 10 meters
130KHz on 80 meters

Best of all the *ENTIRE* antenna is always active!!

To Order Call—(407) 388-2905

*Plus shipping and handling
Florida residents add 6% tax

MasterCard VISA

GAP
ANTENNA PRODUCTS
6010—Bldg J
N. Old Dixie Highway
Vero Beach FL 32967

rfe

rf enterprises

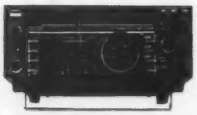
We specialize in antennas and towers!
Call us for all your amateur needs.

YAESU

FT-757 GX-II

FT-767GX; FT-747GX; FT-736R; Handhelds for 2M, 220, &440Mhz; Mobile rigs; Dualbanders; and other Yaesu equipment & accessories. Call!

ICOM



IC-735

160-10M, General Coverage Receive, Dual VFO & 12 Memory Channels, QSK, Compact.

ICOM has a great line of equipment -- from HF to UHF: Mobile and base rigs, receivers -- HF to UHF, handhelds, and accessories. Call us for ICOM.

TEN-TEC

MODEL 562 OMNI V

OTHER TEN-TEC PRODUCTS:

Omni V HF Transceiver
Model 585 Paragon
Model 425 Titan Linear Amplifier
Model 420 Hercules Solid State HF Amplifier
Model 238 Antenna Tuner

ANTENNAS & TOWERS

CUSHCRAFT

A3S (RFE exclusive) Tribander
A4S Tribander
R5 (10,12,15,17,20)
AP8 (80 - 10 Vertical)
AV5 (80 - 10 Vertical)
40-2CD 2-el 40M. beam
A50-5 5-el 6M. beam
617-6B 6 Mtr. boomer
ARX-2B Ringo Ranger II
A147-11 11-el 146-148MHz
215WB 15-el wide band 2M
32-19 19-el. 2M beam
4218XL 18-el 2M Boomer
424B 24-el 432MHz
AOP-1 OSCAR pack

Call for prices on the entire line!

KLM

KT34A.....$409.00
KT34XA.....599.00

HF Monobanders, VHF, UHF, & OSCAR antennas in stock.

ALPHA-DELTA

DX-A Sloper.....$46.95
DX-CC.....79.95
DX-DD.....65.95

HUSTLER

6BTV 80-10 mtr vertical.....$139.95
5BTV 80-10 mtr vertical.....124.95
G6-144B 2 mtr base antenna....89.95
G7-144 2 mtr base antenna..124.95

Complete mobile systems.

BUTTERNUT

HF6VX Vertical, 80-10M.
HF2V Vertical, 80 & 40M.
RMK II roof mount kit
STR II radial kit
TBR-160, coil kit for 160M
WARC resonators
HF5B Compact beam, 20-10M

ROHN TOWERS:

SELF-SUPPORTING

(6 sq. ft. model)

BX64 64 ft. $499

(10 sq. ft. models)

HBX40 40 ft. $289
HBX48 48 ft. $374
HBX56 56 ft. $489

(18 sq. ft. models)

HDBX40 40 ft. $349
HDBX48 48 ft. $464

(Ratings based on 10 ft. boom.)

GUYED TOWER SECTIONS

25G, 45G, 55G & accessories
Call for current prices.

New! 7 ft. UPS shippable 25G sections

FOLD-OVER TOWERS

Call for current prices.

TELEX/hy-gain

Crank-up towers: 37 -70 '

TH7DXS: 7-el. tribander
TH5 Mk2: 5-el tribander
Explorer-14: tribander
Discoverer: 40 Meter beams
205BAS: 5-el, 20 M. beam
204BAS: 4-el, 20 M. beam
155BAS: 5-el, 15 M. beam
105BAS: 5-el, 10 M. beam
18HTS: 80-10 M. vertical
18ATV/WBS: 80-10 M. vertical
V2S; V3S; & V4S
215-DX: 15 el. 144 MHz beam
7031-DX: 31 el. 432 MHz beam
64BS & 66BS: 6 Meter beams
OSCAR Link Antennas

Complete inventory. Call for prices.

ASTRON POWER SUPPLIES

RS-4A.....$ 39.95	**RS-7A**.....$ 49.95	**RS-12A**.....$ 69.95
RS-20A..... 88.95	**RS-35A**..... .139.95	**RS-50A**.....199.95
RS-20M.....109.95	**RS-35M**..... .159.95	**RS-50M**.....219.95
VS-20M.....124.95	**VS-35M**.....174.95	**VS-50M**.....232.95

ACCESSORIES

MFJ

METERS KEYERS TUNERS ACCESSORIES SWITCHES

989C TUNER

TNC UNITS DUMMY LOADS ANTENNA BRIDGES CLOCKS

ASA

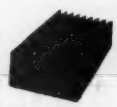
PK-232

Morse, Baudot, ASCII, AMTOR, Packet, Facsimile, & Navtex

AT-300 TUNER

ISOPOLES & M² ANTENNAS

NYE VIKING MBV-A



rf concepts

AMERITRON AL-80A

WIRE & CABLE

BELDEN COAX: (When you want the best)

9913 low loss .....$0.49/ft.	RG8X (9258).....$0.24/ft.
RG-213/U (8267) $0.49/ft.	RG-11A/U (8261) $0.45/ft.
RG-8/U (8237) ....$0.39/ft.	RG-58A/U (8259) $0.19/ft.
RG-8/U (8214) ....$0.43/ft.	RG-59/U (8241) ..$0.20/ft.

RG-214/U (8268).....$2.99/ft.

COPPERWELD ANTENNA WIRE:

Solid: 12 ga...$0.12/ft.; Solid: 14 ga...$0.09/ft.; Stranded 14 ga...$0.10/ft.

ROTOR CABLE:

Standard(6-22, 2-18).....$0.21 Heavy Duty(6-18,2-16).....$0.38/ft.

We stock Amphenol Connectors and Andrew Heliax. Connectors Installed!

VISA **Mastercard**

Personal checks verified with **Telecheck**

Prices subject to change without notice.
Shipping additional except as noted.
Returns subject to 15% restocking fee.

ORDER TOLL FREE

1-800-233-2482

Shipping info., Technical, Inside Minnesota, & DX
218-765-3254
Telex: 4933032 RFE UI FAX: 218-765-3308

rf enterprises
HCR Box 43
Merrifield, MN 56465

More than a source .....a solution.

CIRCLE 142 ON READER SERVICE CARD

rfe enterprises

Offers great HEATH amateur gear!

SA-2060 Delux Antenna Tuner Kit

Heath's tuner matches balanced, unbalanced, and single wire lines from 1.8 to 30 MHz. It switches between antennas and has dual wattmeters for forward and reverse power. It handles inputs of up to 2000 watts PEP on SSB and 1000 watts on CW. The variable inductor and turns counter allow you to accurately set the tuner to predetermined values for frequencies you use. A great kit to build!

SB-1000 Linear Amplifier Kit

A completely self-contained grounded grid linear amplifier that delivers 1000 watts PEP on SSB and 850 watts output on CW. A broad-band tuned input circuit to the 3-500Z tube gives you coverage of 160, 80, 40, 20, and 15 meters PLUS 80% of rated output on MARS and WARC bands. It's easy to build and easy to operate.

Remember the famous Heath SB-220? This is its successor and it develops even more power output.

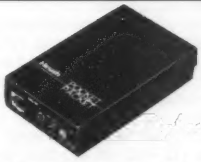
Heath puts building back into amateur radio! Remember your first QSO? It felt good didn't it? You'll experience the same feeling when you switch on a piece of equipment you've built yourself. Order a Heathkit from rfe, build it, and see!

HWS-24HT Dual Band Handheld Transceiver

A great 2 meter and 440 MHz handheld with 20 memory channels plus 2 programmable "call" channels. It may be modified for MARS, CAP, or embassy use. Auto power off, dual VFO, semi- or crossband full duplex, and more!

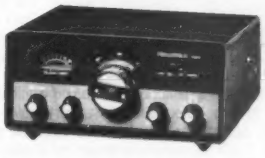
HW-24/HW-24H Twin Band Mobile Transceiver / Repeater

20 memory channels with VHF/UHF operation. Two internal VFO's. Repeater function. The HW-24 runs 10 watts; the HW-24H runs 50 watts.



HK-21 Pocket Packet TNC

The smallest Packet TNC available. A built-in mini bulletin board; TNC-2 compatability; and quick, easy hook-up to your HT or VHF/UHF transceiver



HW-9 Deluxe QRP CW Transceiver

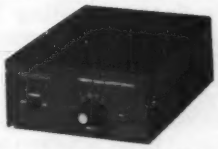
Covers the bottom 250 KHz of 80-15 meters plus 250 KHz of 10 meters. 4 watts out except 3 on 10 meters.

On-line technical assistance: Should you as a Heath owner ever have questions about your equipment, you can get answers from the tech consultants on their direct line: 616-982-3296.

Order with confidence from ***rfe.***

HK-232-A Pack-Kit All-Mode Data Controller

Seven modes, two port configuration for interchangeable HF or VHF operation, supports all common baud rates and CW from 5 to 99 wpm.



HD-1481 Remote Coax Switch (Kit)

Switch up to four antennas remotely. The switch operates through your coax, eliminating control cables. It handles up to 2000 watts PEP from 1.8 to 54 MHz. Tower or mast mount the remote switch unit.

HN-31-A Cantenna Dummy Load (Kit)

Make this Christmas a "Heath Christmas." Heath has great gifts for the amateur and the entire family. Why not enjoy assembling a Heathkit during the long, cold winter?

Happy Holidays from the gang at *rfe.*

George, Gwen, Mel, Cheryl, Randy, & Ralph

MFJ TUNERS

Here is the finest 3 KW Tuner money can buy with roller inductor, dummy load, *new* peak reading meter, antenna switch, balun plus more ... $349.95

The MFJ-989C is not for everyone.

However, if you do make the investment you get the finest 3 KW PEP tuner money can buy - one that will give you a lifetime of use, one that takes the fear out of high power operation and one that lets you get your SWR down to absolute minimum.

The MFJ-989C is a compact 3 KW PEP roller inductor tuner with a new **peak** reading Cross-Needle SWR/Wattmeter. The roller inductor lets you get your SWR down to absolute minimum.

With **three continuously** variable components - two massive 6 KV capacitors and a high inductance roller inductor - you get precise control over SWR **and** the widest matching range possible from 1.8-30 MHz.

You get a **new** lighted **peak** and average reading Cross-Needle SWR/Wattmeter with a **new** more accurate directional coupler.

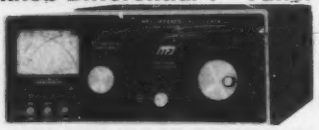
You get a giant two core balun wound with teflon wire for balanced lines and a 6-position antenna switch with extra heavy switch contacts.

Its compact 10¾x4½x15 inch cabinet fits right into your station.

You get a 50 ohm 300 watt dummy load for tuning your exciter, a tilt stand for easy viewing and a 3-digit turns counter plus a spinner knob for exact inductance control. Add $10 s/h.

MFJ-989C **$349.95**

2-knob *Differential-T*™ Tuner



MFJ-986 **$269.95**

The **new** MFJ-986 Differential-T™ 2-knob Tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only **one** best setting. Covers 1.8-30 MHz.

The roller inductor lets you tune your SWR down to absolute minimum. 3-digits turns counter lets you quickly return to your favorite frequency.

You get MFJ's **new** peak and average reading Cross-Needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

A **new** current balun for balanced lines reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced for a more concentrated, stronger signal. Add $10 s/h.

MFJ's *Fastest Selling* Tuner

MFJ-941D **$109.95**

The MFJ-941D is MFJ's fastest selling 300 watt PEP antenna tuner. Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

It matches dipoles, vees, verticals, mobile whips, random wires, banlanced and coax lines.

SWR/Wattmeter reads foward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire, balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun. 1000 V capacitors. 10x3x7 inches.

MFJ's *Random Wire* Tuner

MFJ-16010 **$39.95**

You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn ar[illegible]ndom wire into a transmitting antenna. Great for apartment, motel, camping operation. Install a wire anywhere! Tunes 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 in.

MFJ's *Deluxe* 300 Watt Tuner

MFJ-949D **$149.95**

The MFJ-949D gives you lower SWR than **any** tuner that uses two tapped inductors. Why? Because you get two **continuously** variable capacitors that give you infinitely more positions than the **limited** number on switched coils.

This gives you the precise control you need to get your SWR down to a minimum. After all, isn't that why you need a tuner? Covers 1.8-30 MHz.

You get MFJ's **new** lighted 2-color **peak** and average reading Cross-Needle SWR/Wattmeter, dummy load, antenna switch, and 4:1 balun - all in a compact 10x3x7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

With MFJ's **deluxe** 300 watt PEP tuner you get an MFJ tuner that has earned a reputation for being able to match just about anything - one that is highly perfected and has years of **proven** reliability.

MFJ's *Mobile* Tuner

MFJ-945C **$89.95**

Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C **extends your antenna bandwidth** and eliminates the need to stop, go out and adjust your mobile whip.

You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8x2x6 inches uses little room. **SWR/ Wattmeter and convenient placement of controls make tuning fast and easy while in motion.** 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

144/220 MHz VHF Tuners

MFJ-921 **$69.95**

MFJ's new VHF tuners cover both 2 Meters and the 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. SWR/Wattmeter. 8x2½x3 in. **MFJ-920, $49.95.** No meter. 4½x2½x3 inches.

MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; TELEX: 53 4590 MFJSTKV

MFJ ... making quality affordable

CIRCLE 86 ON READER SERVICE CARD

MFJ's *Artificial* RF Ground

$79.95 MFJ-931

You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically **place a far away RF ground directly at your rig** -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.

Barefoot/1.5 KW Linear Tuner

MFJ-962C **$229.95**

For a **few** extra dollars, the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP linear amplifier later. Covers 1.8-30 MHz.

You get two husky **continuously** variable capacitors for maximum power and minimum SWR. And lots of inductance gives you a wide matching range.

You get MFJ's **new** peak and average reading Cross-Needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Has 6-position antenna switch and a teflon wound balun with ceramic feedthru insulators for balanced lines. 10¾x4½x14 7/8 inches. Add $10.00 s/h.

MFJ's *smallest* Versa Tuner

MFJ-901B **$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner --when both space **and** your budget is limited. Good for matching solid state rigs to linears.

It matches whips, dipoles, vees, random wires, verticals, beams, balanced and coax lines from 1.8-30 MHz. Efficient airwound inductor. 4:1 balun.

FOR YOUR NEAREST DEALER OR TO ORDER

800-647-1800

• 1 year **unconditional** guarantee • 30 day **money back** guarantee (less s/h) on orders from MFJ • Free catalog • Add $5.00 s/h (except as noted)

HAM PROFILES

There are no "average" hams!

Linda Reneau KA1UKM. Linda is 73 Magazine's *Senior Editor.*

Nurse, Author, Poet, Ham

Linda Reneau KA1UKM has been an editor at *73 Magazine* for two years. Last summer she got her Novice license and continues to study for an upgrade. As an adolescent, she was an SWLer and science fiction fan. She belonged to the Astronomy Club of Kansas City, Junior NASA, and the Civil Air Patrol. One of her goals is to start a dream discussion net.

At present, she reads about two SF books a week and is active in astronomy. For physics, she reads Fred Wolf's intriguing books. She's lived in Louisiana, Missouri, New York City, Arizona, Alaska, California, and now New Hampshire. Besides writing and editing, she's worked as a nurse, firefighter, and bookkeeper, among other things.

Recently she completed a book, *A Manual of Dream Art/Science. To the Sky*, a book of poetry, was published in 1984 by Orca Press in Alaska. Other poems have been published in anthologies, and many articles on dream studies have been published in *The Dream Network Bulletin*. She is currently working on a new book, *Dreaming for Spiritual Growth.*

"Da Schmooze"

Jim Bail KA1TGA is a ham with many interests and talents. He was once an aspiring college and semi-pro baseball player. Before graduating from college, he travelled to Germany to open a white-water rafting program for the AFRC (Armed Forces Recreation Command) and in his spare time was a mountain climbing guide in the Bavarian Alps. After teaching environmetal education at an outdoor education school in Trinity, Texas, he spent a season as mainsail driver on an ocean racing yacht.

Jim Bail KA1TGA. Jim is a member of the 73 Magazine *advertising sales team.*

His first job in the communications field was as "Sky Watch One," an airborne traffic reporter for KTRH newsradio in Houston, Texas. He then moved to WKBK radio in Keene, New Hampshire, where he was News Director and hosted a talk show where he interviewed presidential candidates during the 1988 campaign. He has worked for *73 Magazine* for two years and is now an advertising sales representative.

Jim is a community volunteer for the Contoocook Valley (NH) High School's solar racing car and Amateur Radio Club and a member of the Board of Directors of the Red Cross. He will also coach an area Babe Ruth baseball team where he hopes to have a winning season AND to expose his team to the excitement of amateur radio.

Jim is not the only ham in his family. His late grandfather W8BWD, his father NV3J, and his brother N8KIR share and pass on their enthusiasm for the hobby. FM

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback#	Title	Feedback#	Title
1	Welcome Newcomers	15	Homing In
2	Never Say Die	16	QRP
3	QRX	17	Hamsats
4	Home-Brew: VOX for 2AT	18	Looking West
5	Ham Profiles	19	Special Events
6	Review: Yaesu FT-470 2m/70cm HT	20	Letters
7	Home-Brew: Two Meter Mobile Rig	21	Updates
8	Home-Brew: Poor Boy Satellite Station	22	Above & Beyond
9	Book Review: Communications Satellites—A Monitor's Guide	23	Circuits
10	Review: ICOM IC-2SAT	24	Ask Kaboom
11	Review: Ramsey QRP-40 Transmitter	25	New Products
12	Review: Breadblox Breadboarding System	26	Ham Help
13	Home-brew: Color SSTV on the Atari ST—Part I	27	Dealer Directory
14	Packet Talk	28	Ad Index 12/89
		29	Propagation
		30	73 International
		31	1989 Annual Index
		32	Keyword Index 12/89
		33	Barter 'n' Buy
		34	de K6MH
		35	Mirage D15 70cm Amp

73 Review by Michael Jay Geier KB1UM

Yaesu FT-470 2m/70cm HT

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
Tel. (800) 999-2070;
(213) 404–2700.
Price Class: $500

Dual-band fun in an HT only slightly larger than the FT-411.

Yaesu introduced the first dual-band walkie a few years ago. The FT-727R, though somewhat large and power-hungry, was an instant success, and many are on the air today. Recently, miniature dual-banders have begun to appear, and Yaesu is once again at the forefront of the technology with the introduction of the FT-470.

Resembles FT-411

The 144/440 MHz FT-470 is patterned after the highly successful FT-411 series of single-band walkies, and it's impossible not to compare the two rigs. The '470 has the same basic look, a very similar keypad function layout, and a slightly longer and thicker case. It uses the same batteries, mikes, and most of the other accessories.

Small, Powerful Battery

The battery was the first thing I noticed when I opened the box. It was about ½-inch shorter than the FNB-10 which was shipped with my '411. A glance at the back, however, revealed that it had the same 7.2-volt, 600 mA-hour capacity. As it turns out, it even uses the same charger! There is no electrical difference between the two packs. I immediately ordered one for my '411, and I love it; now the rig is truly pocket-sized, with no compromise in performance. If you want to get one, the battery's model number is FNB-17.

The FT-470 is small as dual-banders go. It's about one inch longer than the '411. The supplied YHA-28 duck is actually longer than the radio! By the way, the duck is flexible and appears very well made. The rig fits comfortably in my hand, and the keys are larger and easier to press than those on the '411.

Simultaneous Monitoring

The top of the radio has four controls: squelch (which operates on both bands simultaneously), volume, balance (concentric with the volume control), and the "dial" knob. The balance control adjusts the relative volumes of the two bands. That's right, you can monitor both bands at once! Also on top are the mike and earphone jacks and, of course, the antenna connector.

The Yaesu FT-470 dual-band HT.

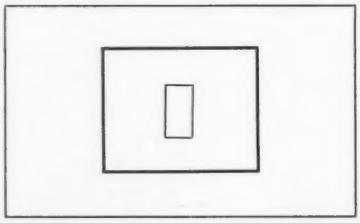


Figure 1. The Kaboom Audio Enhancer for the FT-411 (June '89) works equally well for the FT-470.

The left side houses the rubber buttons for the PTT, squelch monitor, and lamp. As for the '411, the lamp lights the keypad as well as the LCD. I find this very handy for night operation.

All other functions are performed from the keypad. In addition to the usual sixteen keys, there are four more, permitting you to do some commonly-used operations without pressing the FUNCTION button. This arrangement is especially nice for the REVERSE function, which requires only one keypress, instead of the two used on the '411.

Another improvement is the separation of the keypad lock and PTT lock into two keys. Now you can lock the PTT without locking the pad.

The LCD is large and easy to read. The numbers and icons are clearer than the '411's. Both the main band and subband are shown, with the main band's frequency on the left in large numbers, and the subband's on the right, in smaller numbers.

Yaesu opted for a 5½-digit display. The half digit refers to the kHz display. Rather than a zero or a five, there is just nothing for a zero, and a small block which shows "50" for a five. This is somewhat disconcerting when entering frequencies from the keypad, because the display looks the same (for frequencies ending in a zero) before and after you've entered the last digit. Actually, the decimal point only comes on when you finish the entry, but it's easy to overlook. Several times I was unsure whether or not I had entered all the digits. There seems to be no advantage to this kind of display.

The FT-470 includes nearly all the features of the '411. The only thing missing is the VOX circuit, which few of us are likely to use, anyway. Of course, there are new features related to dual-band operation. The BAND key transposes the main and subbands. The SUB key turns the subband on and off. The ALT key allows the rig to alternate between bands during memory scanning.

Memory Functions

The rig has two memory banks, one for each band. Each bank contains 20 memories, any of which can hold odd splits, and the frequency and status of the included CTCSS encoder/

BEST

SIMPLEX PATCH AVAILABLE

VCS-2100 VOX CONTROLLED SAMPLING INTERCONNECT

The Interconnect Specialists Inc. (ISI), VCS-2100, uses a combination of VOX control from telephone line audio, and sampling of receiver noise, to achieve the optimum control method for a simplex interconnect. No sampling interruptions occur during normal conversation. Turn-a-round beeps make operation very smooth and easy.

The VCS-2100 features the ISI exclusive, Automatic Setup. This feature eliminates the trial and error method of sample window setup. Our Quick Start Set-up procedure gets the VCS-2100 up and running, without complicated programming. The VCS-2100 is superior to any other interconnect in its price range. It is a plug-in replacement for the popular 510SA Smart Patch.

FEATURES:

- **AUTOMATIC SET-UP**
  Automatically sets the sample window for your transceiver. No more trial and error.
- **TURN-A-ROUND BEEPS**
  Sends beep to telephone line, and to mobile indicating it's their turn to talk.
- **USER PROGRAMMABLE CW ID**
  CW ID can be programmed using DTMF. ID can be programmed to be sent at the beginning, the end, both, or not at all.
- **AUTOMATIC BUSY DISCONNECT**
  Automatically disconnects if the telephone number dialed is busy.
- **HOOK-FLASH**
  Used to make a second call without disconnecting and re-connecting. Also can be used for phone company services which use Hook-flash.
- **CALL WAITING**
  If a mobile call is attempted and the line is in use, a beep is sent to the phone line indicating that the mobile wants to make a call. Then when the line becomes available, a ring-out is transmitted to the mobile.
- **RING-OUT (REVERSE PATCH)**
  Can be programmed to ring-out one time, on each ring, or not at all, when the line rings.
- **SINGLE OR MULTI DIGIT CODES**
  Connect or disconnect codes can be single * and #, or * and # plus two digits.
- **CALL LIMIT TIMER**
  Can be set for 3, 4, or 5 minutes, or disabled. Can be programmed to reset with *.
- **MOBILE ACTIVITY TIMER**
  Causes disconnect if mobile drives out of range. Can be set to 30, 45, 60, or 90 seconds.
- **TOLL RESTRICT**
  The first digit dialed cannot be a "1" or a "0". Rearms after dialing is complete.
- **PHONE LINE IN USE INHIBIT**
  Prevents interrupting a call when the patch shares the telephone line with a telephone.
- **TOLL RESTRICT DEFEAT CODE**
  A special programmable code allows toll calls. Also allows access to line, even if line is in use.
- **TONE OR PULSE DIALING**
  Switch programmable for Tone or Pulse dialing. Pulse dialing can be used on a tone line.
- **HALF DUPLEX MODE**
  The VCS-2100 can be used as a repeater interconnect in this mode.

Kenwood Compatability with VCS-2100. All connections, required for installation are available at the MIC. connector on most late model Kenwood Transceivers. Interface cables are available from I.S.I.

INTERCONNECT SPECIALISTS INC.

1215 N. CR 427, Suite 105 • Longwood, FL 32750
PHONE 407-332-0533 • TOLL FREE 800-633-3750

CIRCLE 100 ON READER SERVICE CARD

decoder. Two memories in each bank set upper and lower scan limits. Memories may be locked out from scanning, or hidden entirely.

Each band also has a "call" memory, accessible from the CALL key. This memory is just like the others, except that it doesn't get scanned, and you can access it with one keypress. It's especially handy for simplex and hamfest use. It shares one quirk with the '411: If you turn the dial on top of the radio while you are using the call memory, it transfers the frequency to the VFO, trashing whatever was there. The regular memories don't do that.

There are two VFOs for each band, for a total of four! That's a lotta VFOs. Of course, you can never be too rich, too thin, or have too many VFOs, and in a pinch, you can use them like extra memories.

As on the FT-411, memory management is very flexible. Memories can be fixed or tunable, and you can perform various kinds of scanning and priority operations. But this radio can do all of it on two bands at once! You can be memory scanning on 2 meters while band scanning with sequential priority watch on 440! It may sound confusing, but it's easy to do. A multitasking microprocessor with the usual lithium battery backup makes it all possible.

The DTMF pad has a ten-number autodialer. The '411 also has this feature, and I have grown to love it. If you're in walkie range of the repeater, you'll find yourself using it to dial friends while you drive, instead of trying to manually key the autopatch codes and phone number into your mobile rig.

Radio Performance

The receiver and transmitter operate well. The receiver seems considerably more sensitive on VHF than the '411's, especially for public service band scanning. The NOAA weather channel, which is fairly weak on my '411, is full quieting and nearly full scale on the '470's LCD S-meter.

There isn't much 440 activity here in northwestern Vermont, so it is hard to check sensitivity on that band. The local repeater, however, comes in fine. The transmitter sounds crisp on the air. With the supplied battery, it puts out 2.3 watts on both bands. At 12 volts, you get 5 watts. A "low" position cuts the output down to much less, saving battery power. Interestingly, the high/low setting is specific to each band. For instance, you can be set for high on 2 meters and low on 440, or any other combination you desire.

The FT-470 can operate full duplex because it continues to receive on the subband even while transmitting on the main band. Hearing the receiver come to life while you're transmitting is an eerie experience that takes some getting used to. If you add a connection from the earphone jack to the mike jack (with appropriate attenuation, of course), and key the PTT, you've got an instant crossband repeater! [*Ed. note—The author recently became aware of a crossband repeater function, programmable from the rig's keypad by turning on the HT while depressing the RPT key. Tests performed at 73 HQ, in which I and Jim KA1TGA QSOed via the 470 using a 2m HT and 70cm base station, respectively, confirmed the existence of this function. We also confirmed KB1UM's claim that the rig is locked in low power in this mode. (This was likely set since the high power setting in this mode could lead to receiver desense.) It also appears that Michael's suspicion is true that the audio between bands in this mode is acoustically coupled (that is, the audio passes from speaker to mike), since audio quality is considerably poorer at the end receivers when signals are 470-repeated, than it is when the end rigs receive signals directly, and when the 2m HT received a 2m signal from the 470 via the W2NSD/R repeater. Look for KB1UM's mod for better TX/RX signal coupling in crossband repeating with the 470 in an upcoming issue of 73. . . Bryan NS1B*]

As received from Yaesu, the rig only covered 144–148 MHz. There was no extended coverage, and nothing in the book about how to extend it. I tried the reset procedure used on the '411, and after about five tries, it worked! If you need to extend the receiver, just turn off the rig; hold down both arrow keys; then turn it back on. If it still tunes only 144–148, do it again until it works. Of course, all the frequencies in memory will be lost and require re-entry. Once extended, receive coverage is 130–180 MHz, and transmit is 140–150 MHz. UHF coverage is 430–450 MHz. I am not aware of any way to extend it.

"Once extended, 2m receive coverage is 130–180 MHz, and transmit is 140–150 MHz. UHF coverage is 430–450 MHz."

Problems

The FT-470 is a very nice radio. It has advanced features and, with its ability to monitor both bands at once, is like having two radios in one small, handy box. There are some problems, however, about which you should be aware, to make your operation as smooth as possible.

When monitoring both bands at once, the IF "whoosh" noise from the band not being received leaks into the audio of the received signal. It's not nearly as bad as if the squelch were truly open on both bands, but it is fairly objectionable.

There are two ways to avoid this. You can either turn the subband off (which is fine if the signal you're receiving is on the main band), or you can rotate the balance control toward the band you want.

By the way, there is no indication on the display of which band is being received! If you're monitoring both bands and you get a call, you must either rotate the dial or turn off the subband to see on which band the signal lies. Otherwise, you may respond on the wrong band! In future models Yaesu should consider using a blinking dot or other icon next to each frequency to neatly avoid this kind of confusion.

On the FT-411, rotation of the dial temporarily disables the battery saver, so that you can hear channel activity as you pass through the frequencies or memories. On the '470, that function was omitted (although the saver disables properly during automated scanning operations). Thus, you can turn the knob through all your memories, or a segment of the band, and the frequencies will appear vacant even though they may be bursting with activity! You have to turn the saver off to correct the problem.

The battery saver also seems to "miss" sometimes, taking up to ten times as long as it should to notice a signal. I've seen it wait as much as ten seconds before opening up on a signal that was there the whole time. I suspect that it doesn't wake the rig up long enough for the PLL to reliably lock, although that's only a guess. The receive light will flash on each saver cycle (such as 0.5 seconds), but the squelch won't open. Again, the fix is to shut the saver off.

As on the FT-411, the receive audio is not very good. The '470 has the same speaker and grille, and benefits greatly from the Kaboom Audio Enhancer described in my FT-411 review (*73*, June 1989). (See Figure 1.)

The audio makes a substantial "pop" when the squelch opens, which makes it painful when using an earphone. It's no big deal, however, in normal speaker operation.

As on the '411, the low battery icon gives almost no warning at all before the battery dies. I clocked it at 20 seconds from the time the icon blinked (during transmit on high power) to total radio shutdown.

The rig has the same annoying keypad beeper, with its double beeps and tunes. You can turn it off without losing the AUTO POWER OFF warning beeper.

There's a rubber plug flush with the right side of the rig. Pulling it revealed a hole obviously meant for a coaxial DC power jack (which would be nice to have). Yaesu currently doesn't install this jack on the '470.

Future Fixes

I spoke with Chip Margelli, Vice President of Marketing for Yaesu USA. He confirmed the company's awareness of the squelch leak and battery saver problems, but said that there were no fixes at this time. He did say, however, that when solutions became available, Yaesu would fix any FT-470s sent to them.

Conclusion

All in all, the '470 is a very nice radio. If you don't plan on lots of dual-band monitoring, and are willing to work around the battery saver, you'll probably be very happy with it. It's small, powerful, and offers more flexibility than you're ever likely to need! 73

Michael Geier KB1UM is 73's troubleshooting "Ast Kaboom" columnist. You can reach him at 7 Simpson Court, S. Burlington VT 05403.

HF Equipment	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner	3149.00	2699

IC-781 Xcvr/Rcvr/ps/tuner/scope	6149.00	5295

IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1469
PS-35 Internal power supply	219.00	199.95
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	
IC-735 HF transceiver/SW rcvr/mic	1149.00	999.95
PS-55 External power supply	219.00	199.95
AT-150 Auto. antenna tuner *(Special)*	445.00	369.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

IC-725 Ultra compact HF xcvr/SW rcvr	949.00	829.95

Other Accessories	Regular	SALE
IC-2KL HF solid state amp w/ps	1999.00	1699
IC-4KL HF 1KW out s/s amp w/ps	6995.00	5999
EX-627 HF auto. ant. selector *(Special)*	315.00	269.95
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. ant. tuner	445.00	389.95
AT-500 500W 9-band auto. ant. tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	758.00	689.95
AH-2A Antenna tuner system, only	559.00	499.95
GC-5 World clock *(Special)*	91.95	69.95

Accessories for IC-765, 781, 725 - CALL for Prices

ICOM

★ Large Stock
★ Fast Service
★ Top Trades
at AES®

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25w 2m FM/SSB/CW w/ps	1299.00	1099
IC-275H 100w 2m FM/SSB/CW	1399.00	1199
IC-375A 25w 220 FM/SSB *(Closeout)*	1399.00	799.95
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	1199
IC-475H 75w 440 FM/SSB/CW	1599.00	1369
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	1129
IC-575H 100w 6/10m xcvr	1699.00	1499

VHF/UHF/1.2 GHz Mobiles	Regular	SALE
IC-47A 25w 440 FM/TTP mic *(Closeout)*	549.00	369.95
PS-45 Compact 8A power supply	145.00	134.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25w 2m FM, TTP mic *(Special)*	469.00	379.95
IC-28H 45w 2m FM, TTP mic	499.00	439.95
IC-48A 25w 440-450 FM, TTP mic	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25w 2m FM/TTP mic *(Special)*	509.00	429.95
IC-228H 45w 2m FM/TTP scan mic	539.00	479.95
IC-448A 25w 440 FM/TTP mic	509.00	449.95
UT-40 Pocket beep function	45.00	
IC-900A Transceiver controller	639.00	569.95

★ *Closeout Special . . .*
IC-900A Transceiver controller with **UX-29H** 2m/25W and **UX-39A** 220/25W band units.
Package Price • $949.95

UX-19A 10m 10w band unit	299.00	269.95
UX-29A 2m 25w band unit	299.00	269.95
UX-29H 2m 45w band unit	349.00	319.95
UX-39A 220MHz 25W band unit	349.00	299.95
UX-59A 6m 10w unit	349.00	319.95
UX-129A 1.2GHz 10W band unit	549.00	499.95
IC-901 Fiber Optic 2m/440 xcvr	1199.00	1069
IC-1200A 10w, 1.2GHz FM *(Closeout)*	699.00	599.95
IC-2500A 440/1200MHz FM mobile	999.00	869.95
IC-3210A 25w 2m/440 FM/TTP	739.00	649.95
IC-2400A 45w 2m/35w 440 FM/TTP	899.00	789.95
AH-32 2m/440 Dual Band mobile ant	39.00	
AHB-32 Trunk-lip mount	39.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount	24.70	
Larsen PO-MM Magnetic mount	28.75	
RP-1510 25w 2m repeater	1849.00	1649
RP-2210 220MHz 25w rptr *(Special)*	1649.00	1399
RP-1210 1.2GHz 10w 99 ch FM rptr	1529.00	1349

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. All prices shown are subject to change without notice.

Top Trades ! • We'll take your Clean Late Model gear in trade towards New ICOM Equipment.
Write or Call for our Quote Today!
AES® ★ *Over 32 Years in Amateur Radio*

MasterCard USE YOUR CREDIT CARD VISA

Hand-helds	Regular	SALE
IC-2A 2m HT *(Closeout)*	289.00	259.95
IC-2AT 2m/TTP *(Close)*	319.00	279.95
IC-02AT/High Power	409.00	349.95
IC-04AT 440 *(Closeout)*	449.00	389.95
IC-u2AT 2m *(Closeout)*	329.00	279.95

FREE Extra Battery! . . .
BP-23 600ma/8.4V • NO CHARGE with purchase of IC-u2AT

IC-u4AT 440 *(Closeout)*	369.00	199.95
IC-2SA 2m HT	419.00	369.95
IC-2SAT 2m HT/TTP	439.00	389.95
IC-3SAT 220 HT/TTP	449.00	399.95
IC-4SAT 440 HT/TTP	449.00	399.95
IC-2GAT 2m HT/TTP	429.00	379.95
IC-4GAT 440MHz, TTP	449.00	399.95
Special . . . IC-32AT 2m/440 HT	629.00	549.95
IC-12AT 1w 1.2GHz FM HT/TTP *(Special)*	473.00	349.95
IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	469.95

New! IC-2SA 2m HT

Aircraft band handhelds	Regular	SALE
A-2 5W PEP synth. aircraft HT	525.00	479.95
A-20 Synth. aircraft HT w/VOR	625.00	569.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.65
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs	25.99
LC-2AT Leather case for standard models	54.50
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10	24.50

For other HT Accessories not listed please CALL

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$999.00	869.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz-2GHz rcvr *(Special)*	1199.00	999.95
RC-12 Infrared remote controller	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
AH-7000 Radiating antenna	99.00	
R-9000 100KHz-2GHz all-mode rcvr	5459.00	4699

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3
WATS lines are for Quotes & Ordering only, use Regular line for other Info & Service dept.

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 • Phone (414) 442-4200

AES® BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

ERICKSON COMMUNICATIONS CHICAGO, IL is no longer affiliated with AMATEUR ELECTRONIC SUPPLY

Two Meter Mobile Rig

Turn your HT into a 40W, 2m mobile rig.

by Mike Gray N8KDD

The Problem

For several months I had been using my 2 meter HT as a mobile rig. It worked, but I complained frequently about the low RF power, poor audio quality in a mobile environment, and the tiny extension microphone. I really wanted a rugged mobile rig, but I couldn't justify the expense.

The Answer

My solution was to construct a "module" consisting of an RF power amplifier, a comfortable microphone, and a large speaker. Construction was easy and the cost low. I was able to salvage several of the components.

The enclosure is an extruded aluminum box with removable panels and circuit board slots. The external dimensions are 6.5L x 5.5W x 2.5D. You can buy a similar enclosure at the larger electronic supply houses or through the mail.

I simply drilled appropriately-sized holes in the end panel for the connectors and perforated the top panel to serve as a speaker grill.

Amplifier Assembly

The amplifier is a kit from Ramsey Electronics. Performance is just as advertised, and assembly was easy. I have a few complaints, however.

The instructions are complete, but not clear. The text is partially handwritten, and if you follow the order of component installation, you end up having to do some desoldering. It's best to fit the parts on the board first, then decide on the order of assembly. I found that the kit came together the most easily in this order:

1) RF transistor
2) Trimmer capacitors
3) Inductors (coils)
4) Coaxial cable

I also bought the optional RF-sensed relay kit, which includes a nice pretinned circuit board. The relay in the kit will work, but I decided not to use it because it appeared to be too fragile for the task. The terminals were loose in the base, and it was difficult to distinguish one contact set from another. I used a better looking (and more expensive) relay obtained, along with the aluminum enclosure, from Newark Electronics, 4801 N. Ravenswood Ave., Chicago, IL 60640-1084; (312)-784-5100. The relay is a general purpose type made by Potter Brumfield.

It is important to install a large aluminum heat sink on the amplifier board and attach it to the enclosure.

Speaker and Relay

I installed a 3-inch speaker in the aluminum enclosure, attaching it with butyl tape. This installation method may raise a few eyebrows, but it's really a very good way to mount a speaker to an irregular surface. Butyl tape is a bead of very sticky rubber compound used to install windshields. Most glass shops use less than one roll per job, so they have many partial rolls as scrap. A whole roll costs about five dollars, and it has many uses. Cut butyl tape only with a pair of diagonal cutters. The tape will stick to scissors, and you can't tear it off.

Peel some tape off the roll and stick it around the perimeter of the speaker. Determine placement in the enclosure, then carefully press the speaker into place. Be sure you have it in the right place before pressing—removal is difficult!

The relay I chose has 4 contact sets. Only two were needed for the RF, so I used the other two for TX/RX indicators. I used two LEDs because I had them, but one LED which would change color as a function of polarity would be neater.

The Microphone

You'll likely pull a mike off of an old CB rig. Most CB microphones are 600–800Ω. Measure the resistance of an unknown mike with an ohmmeter. The PTT switch and microphone element are in series, and the correct pins can be determined by finding the two which have a resistance of 600–800Ω with the PTT switch depressed (or take it apart and look at it). Yaesu HTs have an audio input impedance of 2200Ω. Consult the manufacturer or owner's manual for the input impedance of other radios. Then, add a resistor between the radio and microphone, equal to the *difference* between the impedance of the microphone and the impedance of the radio.

In my case, I had to install a 1.6kΩ resistor in series to match the radio's 2.2kΩ input impedance:

Audio input impedance
− Microphone impedance
= Resistor value
2200Ω − 600Ω = 1600Ω

The pin assignments are industry standard. Connect the pins on the left side (as viewed from the pin-end of the cord connector) of the index key to the audio input (see Figure 1).

I then removed the mike connector, speaker, and SO-239 connector from the CB radio, and gave the rest of it to my nine-year-old son for further disassembly. If you have to buy these components, they shouldn't cost more than 20–25 dollars.

Final Assembly

I used a dry cell case to connect the radio to a 12 volt source on the amplifier board. The case is easy to drill, and a coaxial power jack fits nicely in the side. I used the same size power jack for both the dry cell case and the power connector on the enclosure, so I could use the radio on low power without the amplifier.

I have 3 different types of cables which provide a 12 volt source. All three have a coaxial power connector on one end. One cable has a lighter plug, another has alligator clips, and the third is hard-wired and remains in the truck.

I have more than one HT, so I decided to mount one semi-permanently, using double-adhesive foam. Though well-secured, I can remove it easily if I have to. There are many more ways to mount the radio, such as with hook-and-loop fasteners, or even attaching a soft case to the enclosure so you can slip the radio in and out.

I now have a reliable 40 watt mobile radio with excellent audio and a microphone that won't get lost or inadvertently keyed. (I later added a simple switch in series with the relay coil to provide a high/low power selection.) Using some salvaged components, the total cost was $44. Not bad at all for mobile QRO from an HT! 73

Parts List

1	power amplifier kit	Ramsey Electronics PA-1
1	RF sensed relay kit	Ramsey Electronics TR-1
1	aluminum enclosure	
1	8Ω speaker, 3-inch	RS 40-248
1	microphone	RS 21-1172
1	SO-239 bulkhead connector	RS 278-201
1	miniature phone plug	RS 274-286
1	subminiature phone plug	RS 274-289
1	chassis mount microphone connector	RS 274-002
1	BNC socket, bulkhead type	RS 278-105
2	coaxial power jacks	RS 274-1563
2	coaxial power plugs	RS 274-1569
1	dual color LED	
1	1600Ω resistor	⅛ watt*
1	620Ω resistor	⅛ watt*
1	BNC patch cable	NPN
1	18-inch length RG-58 coaxial cable	RS 278-1326
1	5-inch length of RG-174 coaxial cable (RG-58 will work just fine)	optional

*Not critical. Improvise, if necessary!

You may contact Mike Gray N8KDD at 465 W. Maple Rd.. Milford MI 48042.

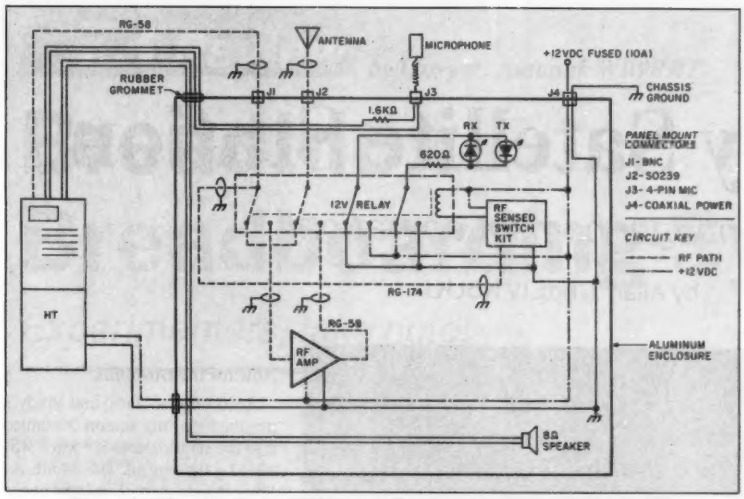


Figure 1. Schematic for the HT booster. Cost for all the parts is less than $50!

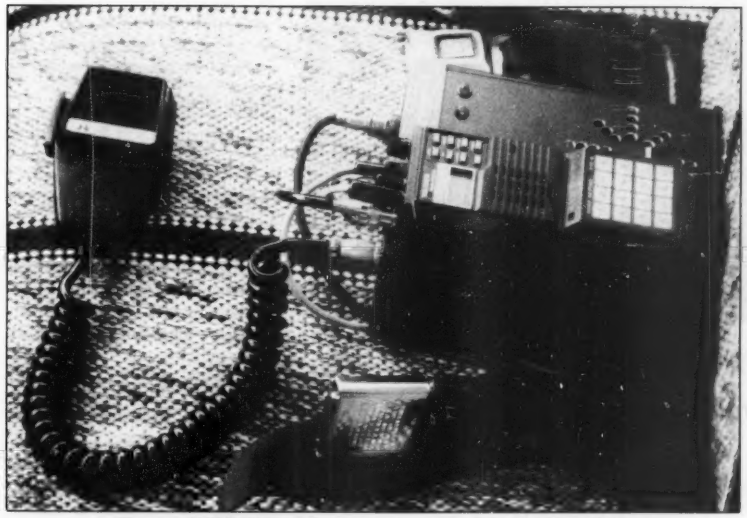


Photo A. N8KDD's mobile station setup. The HT is the Yaesu 23R.

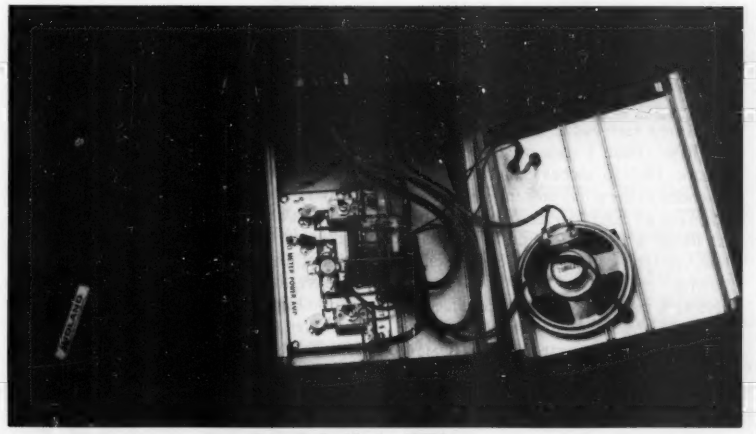


Photo B. Inside the 40W booster.

CIE Cleveland Institute of Electronics

Accredited Member National Home Study Council

CIE is the world's largest independent study electronics school. We offer ten courses covering basic electronics to advanced digital and microprocessor technology. An Associate in Applied Science in Electronics Engineering Technology is also offered.

Study at home — no classes. Programs accredited and eligible for VA benefits.

CIE Cleveland Institute of Electronics
1776 East 17th St., Cleveland, Ohio 44114

YES! I want to get started. Send me my CIE school catalog including details about the Associate Degree program.

Print Name_____
Address_____ Apt._____
City_____ State_____ Zip_____
Age_____ Area Code/Phone No._____
Check box for G.I. Bulletin on Educational Benefits
☐ Veteran ☐ Active Duty MAIL TODAY!

AAR108

CIRCLE 157 ON READER SERVICE CARD

New from AOR

2000 Channels 5MHz to 1500MHz

AR2515

- Covers 5MHz to 1500MHz in AM/FM/Wide FM modes. Continuous coverage.
- 2000 Channel Memory. 1984 Scan Frequencies & 16 Search Groups.
- Scan/Search speeds up to 36 channels or increments per second.
- Built in RS 232 computer interface.
- 25 Day Satisfaction Guarantee. Full Refund if not Satisfied.
- Size: 3½"H x 5⅝"W x 7⅛"D. Wt.: 2 lb. 10 oz.
- Supplied with AC & DC power cords. Telescopic antenna.

Total Price. Freight Prepaid (Express Shipping Optional) *Upgrades of AR2002's to AR2515 specs Available.

$695.00

ACE COMMUNICATIONS
10707 E. 106th St. Indpls., IN 46256
Toll Free 800-445-7717
Visa and MasterCard
(COD slightly higher)
In Indiana 317-849-2570 Collect FAX (317) 849-8794

CIRCLE 355 ON READER SERVICE CARD

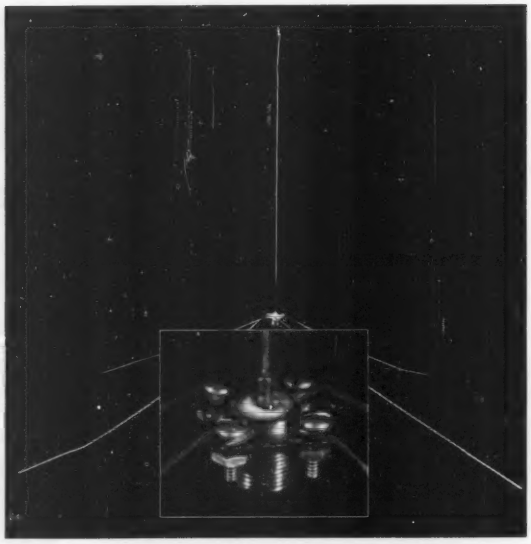
Poor Boy Satellite Station

Coat-hanger hamsat operation!

by Allan J. Fox IV N5LKJ

My satellite chasing began about a year ago, when Carl Kotila WD5JRD, my neighbor, asked me to attend the Houston COM-VENTION '87 with him. There I met Jack Douglas KA5DNP and Andy MacAllister WA5ZIB who were giving a talk on amateur satellites. Jack explained that the Russian satellites RS-10/11 were in a nearly circular, low earth orbit, and did not require expensive equipment or elaborate antennas to operate.

Although I am only a neophyte satellite chaser, I have the satisfaction of having helped several hams become avid satellite enthusiasts on a limited budget.



Two-meter home-brew ground plane antenna.

Original Ground Plane Antenna Station

My station at the time consisted of a 25 Watt, 2 meter all-mode transceiver and a home-brewed ground plane antenna in the attic, similar to one mentioned in the *ARRL Handbook*. I built my antenna in about fifteen minutes out of five coat hangers and a used SO-239 chassis connector. The total cost was less than a dollar.

First, I cut the hooks off the five coat hangers and straightened them out, forming five straight pieces of coated steel wire. To allow a good electrical connection, I put one end of each wire into the hot coals in our fireplace to burn the paint off.

The next step was to solder the bare end of one of these wires into the center conductor of an SO-239 chassis connector to form a vertical radiator. Then, with the aid of needle-nose pliers, I bent a loop in the bare end of the other four wires. This allowed me to attach them to the mounting holes in the SO-239 with four #6-32 ½" machine screws and nuts. These wires were then bent down at a 45 degree angle to serve as radials.

At this point all that remained was to cut all the wires to the proper length. With a tape, I measured each radial 20-3/16 inches and cut them. Then I measured the vertical radiator 19-5/16 inches and cut it. Since I intended to hang this antenna in the attic, I had to cut an extra ½ inch from the vertical and install a ring lug to use as a hanger. However, you could just as easily bend an eye in it.

Now, it was time to connect the feed line and check the standing wave ratio (SWR). Without any adjustments, the SWR stayed below 2:1 throughout the band.

Total investment in this antenna was less than $1.00 and about fifteen minutes construction time.

Now for the Downlink

According to Jack and Andy's presentation, my station contained half the requirements to work RS-10/11—the uplink on Mode A. Since Mode A is 2 meters upper sideband, or CW uplink, with a 10 meter downlink, all I needed was a 10 meter receiver and antenna.

I bought an old Swan 350B transceiver for $50. All I needed was a 10 meter antenna to get on RS-10/11!

While searching the garage for antenna materials, I found an old piece of 12/2 type NM wire, more commonly called Romex. I stripped the Romex to bare copper, and attached it to short pieces of PVC pipe used as insulators. After making a simple 10 meter dipole antenna, I stretched it in the attic and connected it to the Swan. My Poor Boy Satellite Station was almost ready to go on the air!

Frequencies of RS-10/11, Mode A

	Downlink (MHz)	Uplink (MHz)
Transponder RS-10		
Beacon	29.357	
Transponder bandpass	29.360–.400	145.860–.900
Transponder RS-11		
	Downlink	Uplink
Beacon	29.407	
Transponder bandpass	29.410–.450	145.910–.950

Finding and Working the Birds

There are several ways to do this. The first and easiest is to ask an avid satellite enthusiast when and where the next good orbit for your QTH will be. Another method is to use a computer with the appropriate software. (See the May '89 issue of *73* for comparisons of different tracking programs.) We didn't have a computer in our household, but we did have a calculator. Therefore, my method was to tune in the beacon frequency and wait until I heard it. This can be tedious, but I have done it several times.

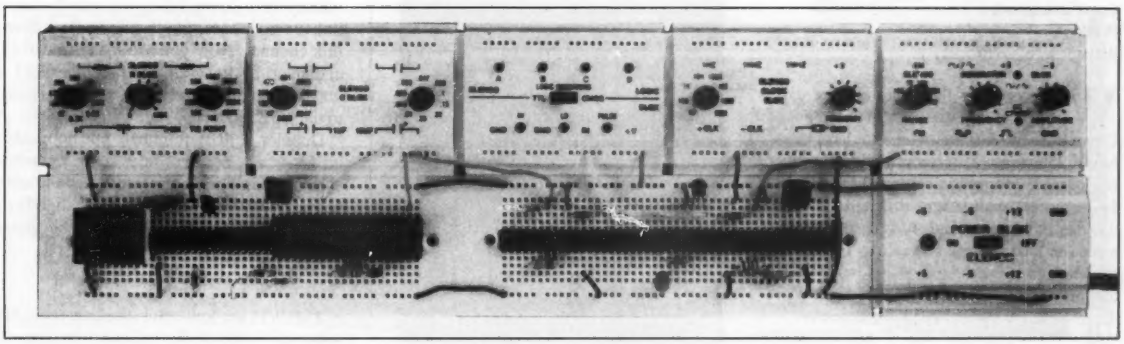
First, tune in 29.357 MHz for the RS-10 beacon, and wait until you hear the beacon transmitting a series of dots and dashes. This indicates that the satellite is in your "window"—that is, your range. You need to work fast because with the optimum pass (direct overhead pass) you will have only 20 minutes with the bird. Note the time and tune through the downlink band, 29.360–29.400 MHz,

73 Review by Larry R. Antonuk WB9RRT

Breadblox Breadboarding System

Experimenters, take note!

Elenco Electronics
150 West Carpenter Avenue
Wheeling IL 60090
(312) 541-3800
Price Class: $19–$29 per unit



The complete six-blox Breadblox system—a circuit experimenter's paradise!

It's probably been quite a while since anyone "breadboarded" up a circuit on an actual breadboard, but the name is still with us. Since that time, experimenters have tried spring-loaded clips, styrofoam blocks, you name it—anything to make it easier to test circuit ideas. The current state-of-the-hobby is represented by the white rectangular "proto boards," those interconnected wonders that eagerly accept DIP ICs. These boards even come in desktop enclosures, complete with power supplies, function generators, and several-hundred-dollar price tags. Prebuilt breadboard working stations are great, provided you have the cash and the room to store them in. But what about the guy who doesn't have space in the apartment to set up a workbench? Or the low-budget hobbyist? Is he stuck with his flea market function generator and "proto board," taped to the kitchen table?

Every once in a while, someone comes along with a blend of existing ideas that solves several different problems at once. The engineers at Elenco Electronics have done just that. They've taken the plain old "proto board" and spun it together with some space age surface-mount technology. The result is a series of "Function Blox" that snap onto their regular "proto boards."

The benefits are many. The Breadblox system is small—four different Function Blox and two Bread Blox (proto boards) will collapse into the same space as a small paperback book. Breadblox all interlock, making for an integrated, easy to move system (an important point for apartment dwellers). They're inexpensive, but provide quality performance. Unlike complete breadboarding systems, Breadblox can be purchased one piece at a time. If you already have a logic probe there's no need to pay for another—just buy what you need.

> ***"Having this much capability at your fingertips makes breadboarding fun again."***

The Blox

There are six different Function Blox, identical in form and color to a standard proto board. The system is powered by a small Power Blox. This snaps to the other Blox, and provides +5, −5, and +12 volts for design use and to power the other modules. (The power is actually produced by a plug-in wall transformer, connected by a cable.)

Resistor and capacitor decade boxes are also available. Twenty resistance values from 47Ω to 1 megohm are available, along with a 100k pot. The Capacitor Blox provides 20 caps from 47pF to 10 µF. Unlike the standard decade box configuration, these units have more than one output. The Resistor Blox has an output for the low values, one for the high values, and one for the pot. The Capacitor Blox has a high and low output, and a 1 µF and 10 µF fixed output. This means that you can actually use four caps at once from one decade Blox.

As far as active devices go, the Digital Clock Blox provides a system clock function. Output frequencies from 1 Hz to 50 MHz are available. In addition, you can lock the unit to an external crystal of your choice. The Function Generator Blox produces sine and square waves from 0.1 Hz to 1 MHz, and can be frequency or amplitude modulated. And, if you don't have your own logic probe, the Logic Probe Blox consists of a 1.5 MHz logic probe, and four LED logic level indicators.

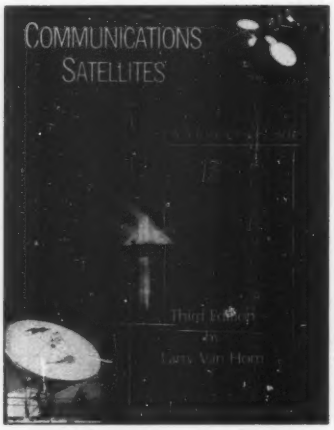
The Elenco Electronics Breadblox system is a low-cost, high-quality, well-designed product. Having this much capability at your fingertips makes breadboarding fun again. And who knows, maybe in fifty years we'll all be "bloxing" up our circuits! 73

Larry Antonuk WB9RRT has written numerous reviews on test equipment and electronics books for 73 Magazine. *He currently works as a project manager for a land mobile service shop in Keene NH. Contact him at 29 Forrest Dr., P.O. Box 452, Marlborough NH 03455.*

73 Book Review by Andy MacAllister WA5ZIB

Communications Satellites—A Monitor's Guide

Communications Satellites—A Monitor's Guide
by Larry Van Horn
Third Edition, 1987
Grove Enterprises
PO Box 98
Brasstown NC 28902



Where can you find more satellite data? Right in Larry Van Horn's third edition of *Communications Satellites*. Within the large paperback's 255 pages, Larry covers virtually every type of space communications from hamsats to the Soviet manned-space program. Detailed information on any satellite, whether it's historical information on Telstar 1 or current military Fleetsatcom frequency data, is right here. For those rare items that may have slipped by the author, there are dozens of references included in the appendix.

Complete Coverage

Even if you're familiar with satellite monitoring, don't pass up the first chapter. The material may surprise you with its complete explanation of satellite monitoring needs. Although it's written so the newcomer won't get lost, it also presents information everyone needs for successful listening. Receivers, antennas, and accessories are examined for modes from CW to TV, and for frequencies from the low MHz through the high GHz.

Of particular interest to hams is the section on the amateur satellite program. There is remarkably accurate and complete historical coverage from the birth of OSCAR 1 (Orbiting Satellite Carrying Amateur Radio) to the frequency charts of AMSAT OSCAR 13. Since the book's publication date two years ago, a few AMSAT nets have changed, but the 20 meter net is a constant source of up-to-date hamsat news every Sunday at 1900 UTC on 14.282 MHz.

Space Missions Well-Documented

The ham-in-space activities of Owen Garriott W5LFL and Tony England WØORE are well-documented. The sometimes forgotten mission of DPØSL on the Challenger shuttle is explained in detail, along with little-known facts about the obscure Russian ISKRA hamsats.

I found myself enthralled with the chapters describing weather satellites and domestic TV satellites. The abundant use of photos and figures makes a dramatic presentation. The equipment requirements listing for weather and TV satellite monitoring is sketchy, but satellite frequencies and transmission format listings are quite complete.

Material covering the manned space programs of the US and the Soviet Union is exciting, and inspires an urgent desire to listen in. While the Soviet *Mir* space station activities on 145.55 MHz are too recent for coverage in the book, many of the frequencies used for normal communications to ground stations with official mission operations are listed and their purposes explained.

Intercepting the Military

The lure of catching transmissions from US military satellites is satisfied by the lists of frequencies used by the various branches of the armed services for both communications and remote detection satellites. A Yaesu FRG-9600 or an ICOM IC-7000 covers the UHF bands.

Information on the Soviet unmanned satellites is hard to find. In one chapter, the author has compiled enough historical data mixed with personal observations to help the enthusiast to ferret out Russian signals from space and identify them. Many of the frequencies used by the Soviets are available on reasonably priced VHF receivers. Geoffrey Perry, of the now-famous satellite sleuthing Kettering Group in England, has spent over three decades pursuing Soviet and Eastern Bloc satellites.

His influence is apparent in this section of the book. The satellite history and compelling volume of satellite data overshadow the somewhat disorganized presentation of some chapters and the rather curious typesetting flaws. After the first reading, the book becomes an invaluable reference.

With frequency lists that go from low HF to "light," just paging through the appendix is captivating. Christmas is coming. Put this book on your list, or better yet, buy it now and tell Santa about some new rigs and antennas. 73

Continued from page 24

while listening for QSOs. Callsigns of bird users will usually give you an idea whether the satellite's orbit is tracking from north to south or from south to north. Each orbit progresses 26.4 degrees west of the preceding orbit. Also, each orbit takes 105 minutes.

Now tune the radios to 145.870 MHz CW uplink and 29.380 MHz downlink, and put on a headset. Since satellite operation is full duplex, wearing a headset is a good practice. Feedback can be unbearable without one.

Second, transmit your callsign, and then send a string of dots on CW—just long enough to find your signal. Adjust the downlink frequency for the best copy. Keep the string of dits *as short as possible* so that, if you discover your downlink is on top of a QSO, you QRM that QSO for no longer than absolutely necessary. Adjust your uplink frequency up or down, following with the downlink tuning in step until you find a clear downlink channel. Now you are ready to call CQ and stand by for your first satellite QSO. If you want to operate phone, be sure to change to the USB mode.

Doppler shift is minimal, but noticeable, on Mode A. You will hear some frequency shift of your signal, and you'll have to compensate your downlink frequency slightly. A little practice, and you'll be accurately guessing the location of the downlink signal.

Summary

RS-10/11 are low-orbit satellites (only 600 miles up)—one of the reasons why you can work them with a simple setup. On one occasion my Swan was in for repair, and while a friend was tuning it, we copied a QSO on RS-11. The Swan was connected only to a dead-end piece of RG-58 coax in his attic with no antenna. Although a preamp helps for RS operation, you usually don't need it.

These satellites do have some drawbacks. Since they are in a low orbit above the earth, the optimum pass gives you only 20 minutes of access to the bird. Definitely not much time for ragchewing! I have made, however, as many as four contacts on a pass. Also due to the low orbit, the satellite "footprint"—the area on Earth from which hamsatters can access the bird at a given point in the orbit—has a radius of only 1500 miles. Even with that, however, you can work most stateside hams to get WAS (Worked All States) via these birds from my QTH near Houston, Texas, and from other mid-western states.

RS-10/11 have several modes of operation other than Mode A, such as Mode K, Mode T, combination Modes KA and KT, and the ROBOT (or QSO machine). However, I have no experience with these. Remember, the control on license-class requirements is the uplink frequency! This makes it possible for even a Novice to operate CW when RS-10 is in either Mode K or Mode T.

Good luck! And don't laugh at my poor boy operation. At 1016Z on 25 November 1988, with only 25 Watts into the coat hangers, I made contact and had a QSO with Musa Manarov U2MIR on 145.550 MHz FM direct, while he was on board the Russian Space Station *Mir*. See you on RS-10/11! 73

WE SHIP WORLDWIDE

Barry Electronics Corp.

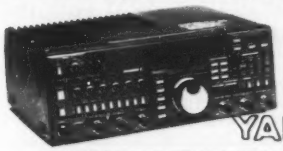
WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York
WE SHIP WORLDWIDE!

Santa Kitty says,
"Seasons Greetings To All"

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:30 PM Thurs. to 8 PM
Come to Barry's for the best buys in town.



ONV Safety belts in stock

ICOM

IC-R71A, 751A, 781, 28A/H, 38A, 48A, Micro2/4, R-7000, IC-765, IC-375A, 275A/H, 3210A, 475A/H, 735, IC-901, IC-228H, IC725, IC-2400A

YAESU

FT-767GX, FT-757GXII, FT-747GX, FRG-8800, FT-736R, FRG-9600, FT-1020, FT-4700RH, FT 212/712RH, FT-470

SMART PATCH

CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone Great For Telephone Calls From Mobile To Base. Simple To Use. 510SA/SDI-50

KENWOOD

ANTENNAS
A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Mosley, Urban, MODUBLOX, TONNA, Butternut, Multi-Band

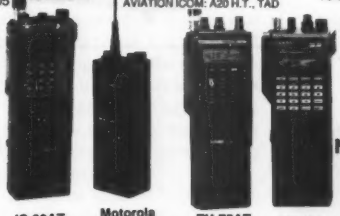
TS440S/AT, R-5000, R-2000, TS-940 S/AT, TM 231A/431A, TM-2570A/50A/30A, TR-751A, Kenwood Service Repair, TM-731A, TS-711/811A, TM3530A, TH205AT, TH215A, TM-631A, TM-331A, TS140S, TS680S, RZ-1, TS-790A, TS950SD.

YAESU
FT-23/73/33
FT411-811
FTC-1903/1123
FTH-2005/7005

ICOM
IC2AT/12AT
IC02AT/32AT
IC2/4GAT
IC-A2/U16

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2005/2007
UNIDEN, REGENCY, KING,
MARINE ICOM: M5, M56, M700
AVIATION ICOM: A20 H.T., TAD

AMPLIFIERS STOCKED:
RF Concepts
Mirage
TE Systems



IC-32AT | Motorola Radius P-100 | TH-75AT | FT-470

PRIVATE PATCH V, Duplex 8000

TUNERS STOCKED:
NYE MBV-A 3 Killowatt Tuner

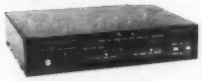
MFJ-989C

Budwig ANT. Products
NEL-TECH DVK-100 Digital Voice Keyer
FLUKE 77, 83, 85, 87 Multimeters

Media Mentors—
Amateur Radio Course

VoCom/Mirage/Alinco
Tokyo Hy-Power/TE SYSTEMS
Amplifiers & 5/8λ HT Gain Antennas IN STOCK

ALINCO
DJ-500T, DR-110T



Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278, PK-232 W/FAX

FREQUENCY COUNTERS: 1MHz-1.3GHz

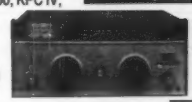
COMMERCIAL & HAM REPEATERS STOCKED. WRITE FOR QUOTES

Kantronics
KAM, KPC II,
KPC 2400, KPC IV,
KAM

Covercraft Coaxseal Stocked

SHORTWAVE RECEIVERS STOCKED

MICROLOG-ART 1, Air Disk, SWL, Morse Coach



Ten-Tec Tuner 238

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER

Professional Soldering Station 48 Watts $79

METRON KW HF Mobile Amplifier Stocked

AR 900 Hand Held Scanner 100 ch. Covers 27–54, 108–174, 406–512, 800–950 MHz

AUTHORIZED
SONY
DEALER

DIGITAL FREQUENCY COUNTERS
OPTOELECTRONICS model 1300 H/A, 0-1300MHz
2210 H, 0-2200 MHz

Radios for Business, Gov't, 2-way, etc. Stocked & serviced, call for great prices!

COMET ANTENNAS STOCKED

HEIL EQUIPMENT IN STOCK

Alpha Delta Products Stocked

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

Long-range Wireless Telephone for export in stock

BENCHER PADDLES. BALUNS. LOW PASS FILTERS IN STOCK

SANGEAN Portable Shortwave Radios

Hy-Gain Towers & Antennas, and Rotors will be shipped direct to you FREE of shipping cost.

AEA 144 MHz
AEA 220 MHz
AEA 440 MHz
ANTENNAS

BIRD
Wattmeters & Elements In Stock

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Belden Wire & Cable, Int'l Wire
OPTO KEYERS STOCKED

New TEN-TEC Corsair II, PARAGON, OMNI V

IIX Towers, Antennas, Mobile Radio mounts stocked. Call.

AMERITRON AUTHORIZED DEALER

MAIL ALL ORDERS TO: **BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST.)**

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670
MERCHANDISE TAKEN ON CONSIGNMENT FOR TOP PRICES

Monday-Friday 9 A.M. to 6:30 P.M. Thursday to 8 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)

IRT/LEX-"Spring St. Station" **Subways:** BMT-"Prince St. Station". IND-"F" Train-Bwy Station"
Bus: Broadway #6 to Spring St. Path-9th St./6th Ave. Station.

COMMERCIAL RADIOS STOCKED: ICOM, Motorola, MAXON, Standard, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters...

ALL SALES FINAL

We Stock: AEA, ARRL, Alinco, Ameco, Ameritron, Antenna Specialists, Astatic, Astron, B&K, B&W, Bencher, Bird, Butternut, CDE, CES, Cushcraft, Daiwa, Eimac, Henry, Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics, Larsen, MJF, J.W. Miller, Mirage, Nye, Palomar, RF Products, Saxton, Shure, Tempo, Ten-Tec, TUBES, Yaesu, Vibroplex, Duplexers, Repeaters, Scanners, Radio Publications, Uniden, Kenwood, Maxon, RFC.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670

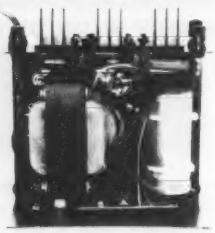
FAX: 212-925-7001

CIRCLE 41 ON READER SERVICE CARD

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •



INSIDE VIEW — RS-12A

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

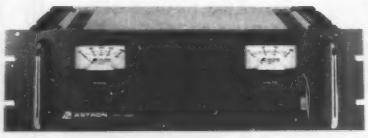
MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES

19″ × 5¼ RACK MOUNT POWER SUPPLIES



MODEL RM-35M

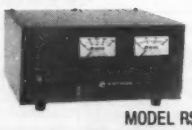
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

73 Review

by Michael Jay Geier KB1UM

The ICOM IC-2SAT

One of the world's smallest full-featured HTs.

ICOM America, Inc.
2380–116th Ave. N.E.
Bellevue WA 98004
Tel. (206) 454–7619
Price Class: $440

The ICOM IC-2SAT, the ultimate in miniaturization.

Can a walkie ever be *too* small? Not as far as this op is concerned. The smaller the better! So I was especially excited to get to try out a little beauty, the new ICOM IC-2SAT.

The operative word here is "wow." The pictures in the ads don't do justice to the compactness of this thing. At first glance, it looks like a toy. It doesn't feel like one, though. The front is firm plastic, and the back is metal and serves as the heatsink for the RF output stage (as with most new rigs). The radio is very solid and, at about 10 ounces (!), it seems hefty for its size. It is somewhat thicker than most small rigs, and has a contoured, sculpted shape, resulting in an unusual, but attractive, appearance. It fits beautifully in your hand. ICOM has paid great attention to the cabinet design, and it shows, the fit and finish being the best I have yet seen in a mini-rig.

After "wow," your next thought may be, "Where's the battery?" Indeed, there is no battery included in the shipping box. This radio has an INTERNAL battery. Yep, this tiny HT is totally self-contained! It has only a 300 mA-hour capacity, though, so ICOM wisely offers optional batteries, in various voltages and current capacities, which snap on the bottom of the rig in the conventional manner.

Good Looking with Nice Touches

The supplied rubber duck is thin, flexible, and somewhat longer than most provided with today's small rigs. In fact, it is slightly longer than the entire radio. No doubt, it has a bit more gain (perhaps less loss is a better description) than the "stubby" ducks usually employed, and that's important here because the rig is rated at only 1½ watts output on high power with the internal battery. The package includes a belt clip (though I can't imagine wanting to put such a small rig anywhere but in a pocket), a wrist strap, wall charger, and a fairly well-written manual with a full schematic. Also included is a crib sheet, a very handy item with a rig this complex. Various options, from the batteries to speaker-mikes and carrying cases, are available.

The top of the radio has the antenna connector, squelch, volume, and "dial" knobs. Also located on top are the DC input, mike, and earphone jacks. The DC jack permits direct operation up to 16 volts (meaning you can plug it into your car cigarette lighter or a DC power supply) and internal battery charging.

On the rig's left side are round, rubberized PTT and FUNCTION buttons, which have an especially nice feel. The LIGHT button, which is also used for a few seldom-performed programming operations, is on the right side. The mike and speaker are located in the middle, with the keypad below them. The keypad has very tiny keys, but they are well separated from each other and easy to press. They are also set in from the front, making accidental keypresses unlikely. It's a nice touch.

Readout Display

The LCD is very large and easy to read, although it loses contrast unless viewed from the bottom. The display shows frequency, ± offset (called "duplex"), memory channel number, power output selection, S-units, and other assorted operating data. It is a 5½ digit display, with no "0" or "5" at the end of the frequency. To display frequencies ending in a 5, a small "50" appears. Many new rigs are taking this approach, and I do not see the advantage; a fully displayed frequency avoids ambiguity and is easier to read.

For night operation, a press of the LIGHT button illuminates the display with an unusual, deep reddish-orange color generated by two LEDs, one on each side of the LCD. It's very pretty, but not overly bright. It should be adequate in most situations. The lamp circuit has a timer that keeps the display lit for a few seconds after the last keypress, or you can turn it off manually by pressing the LIGHT button again. The keypad buttons do not light up.

Alternate Frequency Entry

Another recent trend has been toward the inclusion of a "dial" knob on top of the rig, and this is a good thing. It began with the Yaesu FT-23R, which did not have direct keypad frequency entry, making the knob essential. Now, even direct-entry rigs like the IC-2SAT have the knobs, and they are very handy, permitting easy selection of memories and CTCSS tones, as well as an alternate method of frequency entry.

This rig has provisions for CTCSS boards (an encoder or encoder/decoder) and a DTMF decoder. Neither is included. The new DTMF feature permits coded squelch using the tones generated by any rig with a keypad. Thus, you can use it to ignore any station not transmitting your personal code. You can use it with multiple codes, and even display them on the LCD so you know who's calling! This could prove very handy in large cities where repeater overcrowding makes continuous monitoring tedious. To my knowledge, the IC-2SAT is the first handheld to incorporate such a decoder.

Memory Management

The rig has 48 memories which store frequency and offset, including a handy "call" memory accessible with one keypress. They are fix-tuned. That is, they cannot be used like separate VFOs. (The contents of any memory can easily be transferred to the VFO, though.) The first 10 can hold odd offsets, but not independently entered RX and TX frequencies; you must know the offset. The other memories use whatever offset has been programmed into the VFO. The choice of up or down, of course, remains independent.

Memory management, while fairly flexible, is also a bit unusual. There are four banks of 10 memories each. To get to a memory in your current bank, all you need to do is press its number on the keypad. (You must, of course, be in memory mode first.) To get to a memory in another bank, use the dial knob to step through all the memories in between, or press the MR key until the bank appears. Once you have selected the memory bank, enter the last digit from the keypad.

Here's an example: You are at memory 3 and you want to go to 28. Press MR key until the "tens" digit becomes a 2. Then press 8 on the keypad. It's a bit less convenient than simply pressing "28" and then MR, but it's not hard to get used to.

Skipping and Scanning

Memories can be skip-scanned or hidden entirely. They can also be used to make the

VFO skip certain frequencies during band scanning, another feature I had never seen before. In fact, the frequencies of memories set for skip-scan will also be skipped during VFO scan. It seems like a good idea, but it doesn't really work too well because the rig stops on adjacent frequencies.

The IC-2SAT has several kinds of scanning, including full-band scan, programmable limited-band scan, memory scan and priority watch. Memories are scanned at about 3 per second, a bit slow by today's standards. (VFO scanning is significantly faster, but still not zippy.) A twist of the dial knob lets you change scan direction at will. All memories are scanned together, as if in one bank. You can mix modes. For example, you can have the priority watch check a new memory each time it checks, combining memory scan and priority watch in one operation.

In Addition . . .

You can set the automatic power-off feature to shut the rig down after 20, 40 or 60 minutes of inactivity. It warns you with four beeps, and the warning works even if the keypad beeper is shut off. The beeper, by the way, is soft and unobtrusive. It is one of the few made today that I like to keep turned on.

The timer function includes a real-time clock, and you can set it to turn the radio on at a preset time. The battery saver interval can be set for ½ second, 2 seconds, or off. This seems a bit limited. A choice of around one second would have been nice.

Where most HTs have a *reverse* button, the IC-2SAT has one called MONI. On simplex, it simply opens the squelch. When you're using an offset, however, it shifts to the TX frequency too! It's nice if you want to check the input frequency of a repeater. If, on the other hand, you just want to open the squelch because the repeater's signal is weak, you'll have to use the squelch knob. Also, you cannot transmit on the reversed frequency pair, as you can with a normal *reverse* switch.

The rig has a 10-number by 15-digit autodialler. While sending, it keeps the rig keyed for the duration of the number, even if you let go of the PTT. Also, you hear the tones as they are transmitted. Programming numbers is fairly straightforward, but sending them is not. If you happen to have already selected the autodialler memory you want, then you simply press the DTMF button with the PTT down, and the number is sent. If, however, you need a different number, you must first go to DTMF memory mode, select the desired memory, exit that mode, press PTT and then DTMF. This requires five keystrokes, nearly as many as many numbers! This complexity limits the usefulness of the autodialler unless you usually use only one number anyway.

Radio Performance

The receiver, which covers 138–174 MHz, is very good. It is reasonably sensitive and selective, and the sensitivity holds up very well outside the ham band. The received audio sounds surprisingly good for the size of the rig. An experiment with a Kaboom Audio Enhancer (see the Yaesu FT-411 review on page 14 of the June '89 issue of *73*) improved the audio even more, but the enhancer probably isn't necessary with this radio.

The transmitter, which covers 140–150 MHz, is rated at 1.5 watts output on high power when you are using the internal battery. At 13.8 volts, you get more than five watts output. Reports regarding the transmitted audio suggest that it is clear, but a bit tinny and underdeviated. Overall, it was considered quite acceptable, but not great. It may be that the deviation is an adjustable parameter, but I have no way to know.

Nit Picks

This rig has many advanced features, some common ones seem to have been left out. There is no low-battery warning of any kind. When the battery dies, attempts to transmit result in a flashing display, with no RF output. At that point, of course, it's too late.

In addition, there is no auto (ARRL band plan) repeater shift, a common feature on new HTs. Here, you must set the offset memory. Speaking of repeater shifts, offsets are available only in 25 kHz steps. You can't, for example, enter in a 610 kHz shift. I'm not aware, however, of any repeaters with offsets that are not a multiple of 25 kHz; all the ones I've used have the standard (600 kHz) or 1 MHz split. Also, the display doesn't indicate the status of the auto power off and battery saver functions. You have to go to SET mode to find out if they're on or off.

The manual doesn't have any instructions on how to receive outside the ham band. When entering frequencies from the keyboard, only the last four digits are accepted, so getting out of the 14X.XXX band seems impossible. In fact, the rig is already set up for extended coverage, but you can't get to it directly. You must first select the 10-MHz digit with the quick-tuning-step function by pressing the function button and rotating the dial knob. When you've got the one you want, you then either continue using the dial knob, or you enter the last four digits from the keypad. The whole thing is very inconvenient.

You write memories by holding down the MR/MW key while pressing the function key. You must hold it down for about one second, and entry is confirmed with a series of beeps. With the keypad beeper turned off, you can't tell whether entry is complete, because nothing happens on the display.

The displayed initials for some of the modes and functions are odd, and unexplained in the book. For example, the offset is "OW" and frequency skip is "PS." It's hard to remember this stuff if you are never told what it means.

Many programming procedures are complicated, and not all are consistent. For instance, most modes are terminated by pressing CLR, but the clock setting mode is terminated by pressing PTT. CLR won't work. Some procedures require holding the LIGHT button and a keypad button while turning the rig on. ICOM's walkies use procedures very different from those of the other major manufacturers, and in all fairness, I haven't had that much experience with the ICOMs. I suspect that if you have owned or used other ICOM HTs, this unit will be fairly easy to learn. If not, though, you're in for some surprises, and you will probably want to keep the crib sheet in your wallet.

The review unit did not come with the CTCSS or DTMF decoder boards, so I wasn't able to test those functions. However, the otherwise well-written manual is extremely confusing in the sections describing the use of the DTMF decoder, and I just couldn't make heads nor tails of it. For instance, two modes, *pager* and *code squelch*, are offered, each with its own programming procedures. Except that one uses 7 digits and the other uses 3, I couldn't see the difference between them. Perhaps if I could have tried the procedures, they would have made more sense.

ICOM's ads list the power output as 2 watts, yet the specs in the book list it as 1½ watts. The actual power, as measured on my dummy load/wattmeter (admittedly no laboratory standard) was about 1.75 watts. Also, there are four power level settings available, but only two work with the internal battery. The other two work at higher voltages, such as from a car battery.

The back of the rig gets significantly warmer at 1.75 watts output than does my Yaesu FT-411 at 2.5 watts. This, and the very quick battery depletion, lead me to wonder whether the transmitter efficiency might be low. There are no current drain specs given for normal 7.2-volt operation (the only specs are for 13.8-volt use), so I can't know for sure.

As with most extended-receive rigs, there are some birdies and spurious responses, all well outside the ham band. In particular, a local FM radio station appears repeatedly in the 160 MHz band. None of these anomalies should affect normal use.

Unlike all the other microprocessor walkies I've used, this one does not use a standard lithium battery for backup. Instead, a *rechargeable* lithium battery is used. This might seem like a good idea, but the manual states that this battery will go dead and empty the memories about one week after the main battery is left discharged. So, if you run it down and then go out of town without it for a week, you may come home and find all 48 memories (and all your parameter programming) gone! ICOM may want to consider adding in 7-year lithium cells in future versions for memory/parameter management.

A Terrific Mini-Rig

This is one nifty little radio. Clearly, its greatest advantage is its size, suggesting that the best uses for it are those which do not require an external battery. After all, once you hang a battery on the bottom, it isn't significantly smaller than other mini-rigs. If your usage is light, and especially if you can use low power (the company suggests that the internal battery will be discharged quickly on high power, and they aren't kidding), this rig offers you the ultimate in miniaturization. I'm sure it will prove popular. ICOM's definitely got a winner in the IC-2SAT! 73

Michael Geier KB1UM is 73's troubleshooting "Ask Kaboom" columnist. You can reach him at 7 Simpson Court, S. Burlington VT 05403.

★ ALL NEW KITS ★

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output allowing you to hit the repeaters full quieting while the low noise preamp remarkably improves receptions. Ramsey Electronics has sold thousands of 2 mtr amp kits but now, we offer completely wired and tested 2 mtr as well 220 MHz units. Both have all the features of the high priced boosters at a fraction of the cost.

- 30 WATTS OUTPUT
- LOW NOISE PREAMP
- LOW COST
- RUGGED CAST ALUMINUM CASE
- ONE YEAR WARRANTY

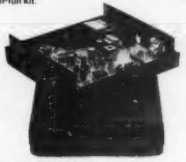
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $69.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $89.95

PERSONAL SPEED RADAR

Complete kit, SG-7 **$89.95**

New low cost microwave doppler radar kit "clocks" cars, planes, boats, horses, bikes, baseballs, models, runners or virtually anything that moves. Operates at 2.6 GHz with over 1/4 mile range. LED digital readout displays speeds in miles per hour, kilometers per hour or feet per second! Earphone output permits listening to actual doppler shift. Uses two 1 lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes deluxe ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

RADIOS



20, 40 & 80 METERS HAM RECEIVERS

Sensitive all mode, AM, CW, SSB receivers for 3.5—4.0 or 70—75 MHz. Direct conversion design using NE602 IC as featured in QST and ARRL handbooks. Less than 1 μv sensitivity, varactor diode tuned, 50 mw audio output. Runs on 9VDC, has RF gain control. This kit is very easy to build, lots of fun and educational—ideal for the beginner or the old pro. The optional matching case kit features a rugged ABS plastic case with screened graphics. Included are machined aluminum knobs for a well-finished professional look.

20 MTR receiver kit HR-2	40 MTR receiver kit HR-4	80 MTR receiver kit HR-8	Receiver case CHR
$24.95	$24.95	$24.95	$12.95

QRP TRANSMITTER KITS, 20, 40 & 80 METERS

Operate a mini ham shack. These little CW rigs are ideal mates to our 40 and 80 meter receivers. Features include smooth variable tuning, one watt output and excellent keying characteristics. Runs on 12 VDC and is VSWR protected. See how far you can stretch your signal with one of these mini rigs. Optional ABS cases are available.

20 MTR QRP Kit QRP-20	40 MTR QRP kit QRP-40	80 MTR QRP kit QRP-80	Case kit CQRP
$29.95	$29.95	$29.95	$12.95

AIRCRAFT RECEIVER KIT

Hear exciting aircraft communications—picks up planes up to 100 miles away. Receives 118—136 MHz AM air band, varactor tuned superhet design with AGC, ceramic filter and adjustable squelch. Runs on 9V battery, 50 mw audio output. 1 μv sensitivity. Optional matching ABS plastic case lets you take it anywhere, features screened graphics and machined aluminum knobs for a real professional look. Compact—great for airshows or for just plain hanging around the airport.

Complete kit, AR-1 **$24.95** Receiver case kit, CAR-1 **$12.95**

SHORTWAVE RECEIVER KIT

A fantastic receiver that captures the world with just a 12" antenna! Receives 4—11 MHz in 2 MHz bands, varactor tuned, superhet design with AGC, RF gain control, and 50 mw audio output. Uses new Signetics mixer chip for less than a microvolt sensitivity, runs on 9V battery. This is a fascinating scout, school or club project, and will provide hours of fun even to the most serious DX er. Add the optional case kit and you have a real nice looking shortwave set.

Complete kit, SR-1 **$24.95** Receiver case kit, CSR-1 **$12.95**

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software, PC board, all necessary parts and full documentation.

Complete kit, PC-1 **$49.95**

FM COMMUNICATIONS/ 2 MTR, 10 MTR & 220 RECEIVERS

Sensitive superhet FM receiver tunes any 5 MHz segment of band. Listen to ham operations, high band police calls, weather or mobile phone calls! Easy to build receiver features varactor tuning, IC mixer stage, ceramic IF filters and dual cnnversion design with adjustable squelch. Less than 1 μv sensitivity, runs on 9 V battery, with 50 mw audio output. Optional ABS case with screened graphics and machined aluminum knobs provide a nice professional look.

2 MTR kit FR-7	10 MTR kit FR-10	220 MHz kit FR-20	Receiver case kit CFR-7
$29.95	$29.95	$29.95	$12.95

NEW MINIKITS—NEW MINIKITS

BROADBAND PREAMP

A sensitive all purpose preamp, ideal for scanners, TV sets, VHF, UHF rigs, counters, etc. Features low noise, 4 db NF, 20 db gain, 100 KHz—1 GHz operation. Runs on 9—12 VDC. 50 ohms input.

Complete kit, SA-7 **$14.95**

LIGHT BEAM COMMUNICATORS

Transmits modulated infrared light up to 30 feet without lenses, up to 1/4 mile using lenses. Uses 30 KHz carrier for hum-free operation, transmits thru windows, etc. Ideal for "bugs" or listening to IR remote controls. Transmitter has sensitive mike input, receiver uses PIN detector and drives speaker output. Units operates on 9—12 VDC

Transmitter kit, LB-6 **$8.95**
Receiver kit, LB-5 **$9.95**

HIGH POWER FM WIRELESS MIKE

A high power unit that will transmit up to 1/2 mile to any FM broadcast radio. Sensitive input accepts any type of mike, will pick up normal voices 10 feet away using the avaiable mini-electric mike cartridge. Operates on 9—12 VDC

FM-4 kit **$12.95**
Sensitive microphone cartridge **$2.95**

RAMSEY ELECTRONICS

Quality Test Gear & Electronic Kits for Professionals and Hobbyists

PA-2 COUNTER PREAMP

The PA-2 is ideal for measuring weak signals from 10 to 1,000 MHz • Bar 25 db gain • BNC connectors • great for sniffing RF • ideal receiver/TV preamp • 3 db NF

$49.95
wired includes AC adapter
PA-2 kit $30.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies Up in frequency • great for PL tone measurements • multiples by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

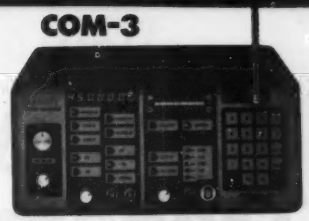
$69.95
wired
PS-2 kit $49.95

PS-108 1.5 GHz PRESCALER

Extends the range of your present counter to 1.5 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1.5 GHz in, 1.5 MHz out • drives any counter.

$89.95
wired includes AC adapter

COM-3



$2795.00

THE COMMUNICATIONS SERVICE MONITOR THAT WORKS HARDER FOR LESS.

Introducing COM-3…the new service monitor designed by service technicians for service technicians. It works harder for less…giving you advanced testing capabilities at a very affordable price.

FEATURES • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10,000 μv output levels • High receive sensitivity, less than 5 μv • 100 KHz to 999.9995 MHz Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder, 1 KHz and external modulation

MINI KITS—EASY TO ASSEMBLE—FUN TO USE

TONE DECODER
A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 **$5.95**

40 WATT 2 mtr PWR AMP
Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.
PA-1, 40 W pwr amp kit **$27.95**
TR-1, RF sensed T-R relay kit **6.95**

COLOR ORGAN
See music come alive! 3 different lights flicker with music. Use light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W runs on 110VAC.
MIL-1 Kit. **$8.95**

VOICE ACTIVATED SWITCH
Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED or even a tape recorder motor. Runs on 9 VDC.
VS-1 KIT **$6.95**

VIDEO MODULATOR
Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit. JM-7 **$12.95**

LED BLINKY KIT
Alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights. Runs on 3 to 15 volts.
BL-1 Kit. **$3.95**

UNIVERSAL TIMER
Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.
UT-5 Kit **$5.95**

MAD BLASTER
Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC
MB-1 Kit **$4.95**

WHISPER LIGHT
An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.
WL-1 Kit **$6.95**

FM WIRELESS MIKE
Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.
FM-1 Kit **$5.95**
FM-2 Kit **$7.95**

SIREN
Produces upward and downward wail. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.
Complete kit, SM-3 **$3.95**

SUPER SLEUTH
A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.
BN-9 Kit **$5.95**

60 Hz TIME BASE
Runs on 5-15 VDC. Low current (25ma) 1 min/month accuracy
TB-6 Kit **$5.50**
TB-6 Assy **$9.95**

TELEPHONE TRANSMITTER
Low cost with professional performance. Features include; self phone line powered, tunable from 76 to 100 MHz, polarity antisensitive, compact size (1" x 1¼"), easily installs anywhere on the phone line or inside the instrument itself.
PB-1 KIT **$14.95**

FM RECEIVER
For built-in applications or hobby experimentation. Full fledged superhetrodyne receiver, microvolt sensitivity. 10.7 MHz IF. Integrated Circuit detector. 50 mw audio amplifier, 9V external power source, operation on standard FM broadcast band as well as large portions on each side, compact (6" square), for bug detection or reception
FR-1 KIT **$14.95**

FM MINI MIKE
A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.
FM-3 Kit **$16.95**
FM-3 Wired and Tested **19.95**

NEW

MICROWAVE INTRUSION ALARM
A real microwave doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz and is not affected by heat, light or vibrations. Drives up to 100 ma output, normally open or closed, runs on 12 VDC.
Complete Kit, MD-3 **$16.95**

NEW

SPEECH SCRAMBLER
Communicate in total privacy over your telephone or radio. This scrambler kit features full duplex operation using frequency inversion. Runs on a 9 volt battery. Both mike and line or speaker output/inputs. Easy to connect to any radio—telephone use requires no direct connection! Easy to build, uses IC DBM circuitry. Can also be used to descramble most com. scramblers.
Complete kit, SS-7 **$29.95**
Case kit, CSS-7 **12.95**

FREQUENCY COUNTERS

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one year warranty on parts and labor. We take great pride in being the largest manufacturer of low cost counters in the entire USA. Compare specifications. Our counters are full featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry and durable high quality epoxy glass, plated-thru PC Board construction. All units are 100% manufactured in the USA.

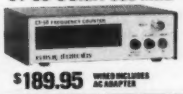
CT-70 7 DIGIT 525 MHz

$139.95 WIRED INCLUDES AC ADAPTER

CT-90 9 DIGIT 600 MHz

$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz



$189.95 WIRED INCLUDES AC ADAPTER

CT-125 9 DIGIT 1.2 GHz

$189.95 WIRED INCLUDES AC ADAPTER

ACCESSORIES FOR COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail for CT-70, 90 & 125	3.95
Nicad pack for CT-70, 90 & 125	8.95

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
CT-70	20 Hz-550 MHz	< 50 mv To 150 MHz	1 PPM	7	1 Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 Mhz	1 PPM	9	0.1Hz, 10Hz, 100 Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.00

MasterCard VISA

TERMS: • satisfaction guaranteed • examine for 10 days, if not pleased, return in original form for refund • add 6% for shipping and insurance for a maximum of $10.00 • foreign add 15% for surface mail • $200 add $2.75 (COD in USA only) • orders under $20.00 add $1.50 • NY residents add 7% sales tax • 90 days parts warranty on all kits • 1 year parts & labor warranty on all wired units

PHONE ORDERS CALL
716-924-4560
FAX 716-924-4555

RAMSEY ELECTRONICS, INC. 793 Canning Parkway, Victor, NY 14564

CIRCLE 34 ON READER SERVICE CARD

73 Review *by Kenny A. Chaffin WB0E*

Ramsey QRP-40 Transmitter

Ramsey Electronics
793 Canning Parkway
Victor NY 14564
Tel: 716–924–4560
Price Class: $30. Case kit: $13

Get a 40m transmitter quickly and easily with this kit.

Ramsey Electronics of Victor, New York, provides a painless way to get involved in QRP construction and operation. They offer three 1-watt output QRP transmitter kits, for 20m, 40m, and 80m. I first saw these kits advertised in *73 Magazine*, and I called to find out more about them.

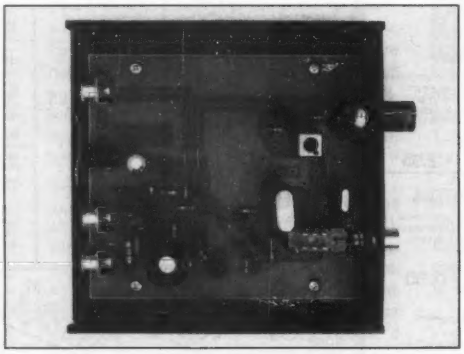


Photo A. Component side board of the QRP-40 transmitter. Parts installation is easy since the board isn't crowded.

Fast Delivery

I ordered the 40m version, since that's my favorite QRP band, along with the case kit. When it arrived two days later, I could hardly wait to heat up the old soldering iron. Unfortunately, I had to wait a bit. We have three kids all under three years old, the most recent addition being three weeks old. As you might imagine, this sometimes causes QRM with my hobbies.

Even so, I didn't waste any time opening up the package and checking it out. The case was machined and marked, and included the front panel knobs, but the connectors and switches were part of the QRP-40 kit. The case kit consists of the plastic case itself, custom front and rear panels, and knobs for the controls which come in the transmitter kit. Having a custom case, though not essential, simplifies and completes a project. I was pleased with everything I saw.

Design and Tuning

The QRP-40 arrived in a plastic bag designed to hang on a pegboard display. The bag contained the 4" x 5" (100 x 127 mm) circuit board along with all of the other parts. The first thing I did was pull out the one-page instruction sheet and examine the circuit. It's a four-transistor transmitter design with a VXO arrangement. That it's a VXO circuit wasn't mentioned in the advertisement I saw, but it's explained in the Ramsey catalog.

I was immediately pleased that it allowed for two crystals selectable by one of the two front panel controls. The other control is a potentiometer for tuning the VXO. The instruction sheet indicated a tuning range of 10 kHz, which is about what could be expected from a VXO circuit on 40 meters.

It's disappointing that the crystal is for 7150 kHz, nowhere near either the standard 7040 kHz QRP frequency or the 7110 kHz Novice QRP frequency. If you want to operate the recognized QRP frequencies, you have to either order the right crystals or pull them out of other equipment. The supplied crystal is a standard HC18/U from Jan Crystals, but the instructions say that almost any style will work.

Antenna

I thought I'd need an antenna switch to connect my vertical antenna to either the QRP-40 or my transceiver, as in the old days when I had a separate transmitter and receiver, but I didn't. The QRP-40 has a built-in diode switching arrangement that provides an antenna output to a receiver! Good job, guys.

Next, I checked all the parts against the parts list. Some of the transistors come in a couple of flavors, but the variations are all listed, so it shouldn't cause any confusion. A couple of hand-written additions to the instruction sheet concern the resistor-like inductors that are part of the kit. If you aren't familiar with this type of inductor, which looks almost like a resistor, it can confuse you. The most notable difference is that the inductors have silver bands on both ends and the color code in the middle.

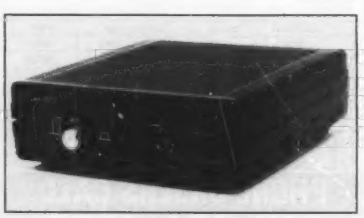


Photo B. Front. . .

Photo C. . . and back panel of the QRP-40.

QRP-40 Transmitter Kit

Power out	1 watt
Circuit	four transistors, crystal control
Controls	A/B crystal switch
	VXO tuning control
Power	12–14 VDC

Over 9000 Ham Equipment Items Are Just A Phone Call Away...

Ross and Sherry showing just one wall full of Ham Equipment. Thousands of feet of shelving are loaded with everyday and special Ham needs.

Call Ross Today

(208) 852-0830

We Are Stacked High With All The Name Brands

- ★ Kenwood
- ★ Icom
- ★ Yaesu
- ★ AEA
- ★ Astron
- ★ MFJ
- ★ Nye Viking
- ★ Telex Hy-Gain
- ★ Ten-Tec
- ★ Hustler
- ★ Ameritron
- ★ Bencher
- ★ Bird
- ★ Butternut
- ★ Barker & Williamson
- ★ Alinco
- ★ Cushcraft
- ★ Connect Systems
- ★ JSC
- ★ KLM
- ★ Kantronics
- ★ Larsen
- ★ Mirage
- ★ Magnus
- ★ Palomar Engineers
- ★ Rohn
- ★ Sony
- ★ Tri-Ex Tower
- ★ Uniden
- ★ Van Gorden Engineering
- ★ Vibroplex

And Many More

All Orders Promptly Shipped

FOB Preston, Idaho

Some 30 years ago Ross Hansen started distributing and selling electronic parts, tubes, resistors, TV wire, etc. Nationally known brands have since been added to the store's lines.

Fifteen or so years ago, we advertised nationally on a very limited basis concentrating more on Amateur sales with each passing year. Now the inventory includes more than 9000 Ham-related items and includes all popular equipment. Since the firm now relies mainly on word-of-mouth, keeping the overhead down, we are able to give good service at low prices. We fill the order immediately and the owner, Ross Hansen, usually answers the phone personally to take care of your every need.

Also Look For Future Ads & Classifieds

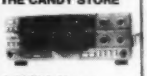
SUPER SPECIALS

Yaesu	FT-747GX	Under $700.00
	FT-73RTT	Close Out $264.99
Icom	IC-471A	Close Out $680.99
	IC-725	Under $830.00

THIS MONTH'S GOODIE FROM THE CANDY STORE

RDC

Kenwood TS-440S Under $1079.99



Similar savings on Kenwood, ICOM, Yaesu, Hygain, etc. All L.T.O.

Kenwood, TW-4100A, $459.99 (Close Out)

Over 9000 Ham Items In Stock, All Prices Cash FOB Preston. More specials in Ham-Ads. Looking for something not listed??? Call or Write:

ROSS DISTRIBUTING COMPANY
78 South State Street, Preston, Idaho 83263
Telephone (208) 852-0830
Hours: Tuesday-Friday 9:00-6:00, 9:00-2:00 Mondays
Closed Saturday and Sunday.

Ross and Kathy In Shipping

Ross At The Bench

Watch For Our Monthly Goodie From The Candy Store

RDC

Ross Distributing Company

P.O. Box 234, 78 South State Street, Preston, Idaho 83263

Telephone (208) 852-0830.

Hours: Tuesday-Friday 9:00-6:00, 9:00-2:00 Mondays

CIRCLE 254 ON READER SERVICE CARD

After verifying that nothing was missing, I carefully put all the parts back in the bag and waited for an opportunity to begin.

Assembly

My chance came the following day. With the kids and wife napping, I sneaked to the basement and heated up the ol' Weller soldering iron. Even though the QRP-40 is a relatively simple circuit with about 50 parts, it is by no means a Heathkit. It doesn't guide you step-by-step (e.g., "Insert R31 [red-brown-green] at position A12."). For this kit, you have to know what resistors and capacitors are, and how to read their values. The entire assembly instructions consist of nine steps:

1. Orient the circuit board.
2. Install jacks and switches.
3. Install capacitors.
4. Connect a 100Ω resistor to a 220 μH inductor, and install as shown on the figure.
5. Install resistors (47k on solder side).
6. Install diodes and transistors.
7. Install inductors.
8. Install crystal.
9. Check all solder connections.

The only difficulty was positioning a couple of the transistors. Q2, in my kit, is almost round. It took me a second to find the flat side. The parts placement drawing was a great help in figuring this out. Q4, on the other hand, is almost square. It does, however, have a couple of missing corners on one side. If you assume this is the rounded side, and the other side flat, you'll have it right.

Unused holes on the circuit board are indicated on the layout drawing, something often overlooked in kits. This makes it easier to check placement.

I completed the entire assembly by the time the kids got up from their naps, about an hour and a half. This was enough time for me to check and make sure I'd installed and soldered everything properly. Depending on your experience with kit building, allow from one to three hours.

Apprehension

Power input can range from 12 to 14 volts, so I connected the board to my 2 meter rig's power supply. I had to scrounge around a bit to find connectors and adapters to connect the dummy load and antenna. The QRP-40's two antenna connectors and key connector are all phono plugs. Fortunately, from my work with the HW-7 QRP rig and a couple of home-brew preamps, I had phono-to-UHF adapters.

The switch for the crystals is not marked on either the board or the schematic as to which position is for which crystal, but it's relatively easy to figure out. The front panel of the case is marked, but, for you who get the kit without the case kit, remember that *out* is position A, and *in* is position B.

I selected position A, the 7150 kHz crystal, and connected the transmitter to my antenna via a wattmeter. I turned the power switch on for about half a second and then quickly backed it off. No smoke. Good. Everything looked fine, so I turned the power back on and pressed the key. Yeah! Power out! The wattmeter showed about 1 watt.

Adjustment and Tuning

The next step was to check the receiver and verify the frequency. Sure enough, it was at 7145 kHz. Checking the range of the tuning control, which is a 5k pot, gave a range of about 7145 to 7150 kHz. The only internal adjustment is a coil in the oscillator circuit that adjusts the tuning range. Trying various settings and adjustments, I was able to get the lower limit down to about 7140 kHz, but I could never get a range of more than 7 kHz. Close, but not quite the claimed 10 kHz. The tuning range of a VXO is highly dependent on the type of crystal and other factors, so I don't consider this a significant problem.

Later, I found some old FT-243 style crystals in my junk box and decided to try them just for grins. They seemed to work, though the tone of the output signal was nothing to write home about, and the tuning range was non-existent. It's probably best to avoid older crystals and stick with the newer canned crystals. I tested the transmitter with a wide range of crystals, and the power output remained 1 watt, regardless of frequency.

Installing the board in the case is simple. Ramsey provides rubber feet for the bottom half of the black plastic case. The top and bottom are identical, except that the bottom has two holes for screws to secure the case. The circuit board is a tight fit. Place the front panel on the board and fit these together into the bottom. Four screws hold the board in place. After screwing the board down, you can attach the back panel and top.

I ran into a slight problem with the button for the crystal select switch. It was too loose to fit on the switch shaft, at least in my kit. Folding a strip of paper and inserting it between the shaft and the button snugged up the fit enough.

On the Air!

Operating with 1 watt with a vertical is a world apart from operating with a kilowatt and a seven element beam. You have to use a few tricks, like tail-ending, calling a station when he finishes a QSO, or answering a CQ rather than calling CQ.

At first I had no luck, even following my own advice above. Then I remembered, from the days of separate transmitters and receivers, that a CW signal has two sidebands. Most modern tranceivers use only one of these. After getting on the other sideband, opposite of the way my Heath 5400 normally operates, it worked. The first CQ I answered heard me. K5KS in Albuquerque, New Mexico, was my first 1 watt contact. He valiantly gave me a 559, and we chatted for a few minutes while I attempted to contain my enthusiasm. It's quite a feeling to have a QSO going well, and even rag-chewing a little, on 1 watt. Amazing!

The next day I had a contact with Joe N3NJ in Pittsburgh, and others around the States. I haven't worked any foreign DX with the QRP-40 yet, but, since it's been done often in the past, so it's only a matter of time. I can hardly wait to work New Zealand with 1 watt.

Conclusion

Ramsey has a limited warranty on its kits and telephone help if you have problems, but with the simplicity of this particular kit it should be smooth sailing.

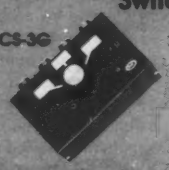
The final QRP-40 transmitter, installed in its case, measures about 5" x 5½" (127 x 140 mm), and is a nice-looking, although small, addition to my station.

Is it worth the money and effort? Absolutely. If you're looking for an easy way to build a QRP rig, this is it. Quick delivery, complete kit with good instructions, and easy operation. And it's always more fun to get on the air using something you built yourself. If you're not into scrounging for parts, this may be the kit for you. Happy QRPing!

Kenny A. Chaffin WB0E, 2942 South Wabash Circle, Denver CO 80231.

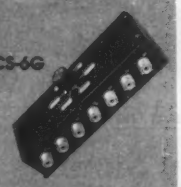
coaxial R. F. antenna switches

Heavy Duty switch for true 1 Kw POWER – 2 Kw P.E.P.
Ceramic with Coin Silver Switch Contacts



Single Pole, 3 Position.
Desk or wall mount
All unused positions grounded

#CS-3G – UHF connectors / **$36.50***
#CS-3G-BNC – BNC connectors / **$43.95***



Single Pole, 5 Position.
All unused positions grounded

#CS-6G – UHF connectors / **$46.50***
#CS-6G-BNC – BNC connectors / **$59.50***

*Shipping and handling for any item add $2 each.

ALL OUR PRODUCTS MADE IN USA
BW BARKER & WILLIAMSON
Quality Communication Products Since 1932
At your Distributors write or call
10 Canal Street, Bristol PA 19007
(215) 788-5581

CIRCLE 53 ON READER SERVICE CARD

uniden®

$12,000,000 Scanner Sale

Uniden Corporation of America has purchased the consumer products line of Regency Electronics Inc. for $12,000,000. To celebrate this purchase, we're having our largest scanner sale in history! Use the coupon in this ad for big savings. Hurry...offer ends March 31, 1990.

★★★ MONEY SAVING COUPON ★★★

COUPON COUPON

Get special savings on the scanners listed in this coupon. This coupon must be included with your prepaid order. Credit cards, personal checks and quantity discounts are excluded from this offer. Offer valid only on prepaid orders mailed directly to Communications Electronics Inc., P.O. Box 1045 – Dept. UNI3, Ann Arbor, Michigan 48106-1045 U.S.A. Coupon expires March 31, 1990. Coupon may not be used in conjunction with any other offer from CEI. Coupon may be photocopied. Add $12.00 for shipping in the continental U.S.A.

Regency TS2-T $259.95
Regency R1600-T..... $239.95
Regency R1099-T..... $99.95
Regency RH606B-T..... $419.95
Regency RH256B-T..... $294.95
Bearcat 200XLT-T2..... $229.95
Bearcat 100XLT-T $184.95
Bearcat 800XLT-T2..... $229.95
Uniden HR2510-T $229.95
Uniden HR2600-T $274.95
Uniden PRO500D-T2..... $29.95

★★★★ VALUABLE COUPON ★★★★

Bearcat® 760XLT-T

List price $499.95/**CE price $244.95/SPECIAL**
12-Band, 100 Channel • Crystalless • AC/DC
Frequency range: 29-54,118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅜" D. Model **BC 590XLT-T** is a similar version without the 800 MHz. band for only $194.95. Order your scanner from CEI today.

NEW! Regency® Products

R4030-T *Regency* 200 ch. handheld scanner $254.95
R4020-T *Regency* 100 ch. handheld scanner $189.95
R4010-T *Regency* 10 channel handheld scanner... $114.95
R1600-T *Regency* 100 channel mobile scanner $244.95
P200-T *Regency* 40 channel CB Mobile $38.95
P210-T *Regency* 40 channel CB Mobile $56.95
P220-T *Regency* 40 channel CB Mobile $79.95
P300-T *Regency* 40 channel SSB CB Mobile..... $137.95
P400-T *Regency* 40 channel SSB CB Base..... $174.95
PR110-T *Regency* "Passport" size radar detector $114.95
PR120-T *Regency* "micro" size radar detector.... $144.95
MP5100XL-T *Regency* 40 Ch. marine transceiver... $139.95
MP5510XL-T *Regency* 60 Ch. marine transceiver... $159.95
MP6000XL-T *Regency* 60 Ch. marine transceiver... $209.95
MP2000XL-T *Regency* handheld marine trans..... $189.95

Regency® RH256B-T

List price $799.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority
The *Regency* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-T** is available for $429.95. A UHF 15 watt, 16 channel version of this radio called the **RU156B-T** is also available and covers 450-482 MHz. but the cost is $454.95.

★★★ Uniden CB Radios ★★★

The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 810E to the 310E handheld, there is no better Citizens Band radio on the market today.

PRO310E-T *Uniden* 40 Ch. Portable/Mobile CB... $83.95
PRO330E-T *Uniden* 40 Ch. Remote mount CB.... $104.95
PRO500D-T *Uniden* 40 Channel CB Mobile $38.95
KARATE-T *Uniden* 40 channel rescue radio $53.95
GRANT-T *Uniden* 40 channel SSB CB mobile.... $166.95
MADISON-T *Uniden* 40 channel SSB CB base... $244.95
PC122-T *Uniden* 40 channel SSB CB mobile..... $119.95
PRO510XL-T *Uniden* 40 channel CB Mobile..... $38.95
PRO520XL-T *Uniden* 40 channel CB Mobile..... $56.95
PRO530XL-T *Uniden* 40 channel CB Mobile..... $79.95
PRO540E-T *Uniden* 40 channel CB Mobile..... $97.95
PRO640E-T *Uniden* 40 channel SSB CB Mobile ... $137.95
PRO710E-T *Uniden* 40 channel CB Base $119.95
PRO810E-T *Uniden* 40 channel SSB CB Base ... $174.95

★★★ Uniden Radar Detectors ★★★

Buy the finest *Uniden* radar detectors from CEI today.
TALKER-T2 *Uniden* talking radar detector $144.95
RD7-T *Uniden* visor mount radar detector $99.95
RD9-T *Uniden* "Passport" size radar detector..... $114.95
RD9XL-T *Uniden* "micro" size radar detector..... $144.95
RD25-T *Uniden* visor mount radar detector..... $54.95
RD500-T Uniden visor mount radar detector..... $74.95

Bearcat® 200XLT-T2

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-T** for only $189.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-T2

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-T** is available for $178.95.

Bearcat® 145XL-T

List price $189.95/**CE price $94.95/SPECIAL**
10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC
Bands: 29-54, 136-174, 406-512 MHz.
The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions. A mobile version called the **BC560XLT-T** featuring priority, weather search, channel lockout and more is available for $94.95. CEI's package price includes mobile mounting bracket and mobile power cord.

President® HR2510-T

List price $499.95/**CE price $239.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Auto Squelch RIT • Preprogrammed 10 KHz. Channels
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *President* HR2510 Mobile 10 Meter Transceiver made by Uniden, has everything you need for amateur radio communications. Up to 25 Watt PEP USB/LSB and 25 Watt CW mode. Noise Blanker. PA mode. Digital VFO. Built-in S/RF/MOD/SWR meter. Channel switch on the microphone, and much more! The HR2510 lets you operate AM, FM, USB, LSB or CW. The digitally synthesized frequency control gives you maximum stability and you may choose either pre-programmed 10 KHz. channel steps, or use the built-in VFO for steps down to 100 Hz. There's also RIT (Receiver Incremental Tuning) to give you perfectly tuned signals. With receive scanning, you can scan 50 channels in any one of four band segments to find out where the action is. Order your HR2510 from CEI today.

NEW! President® HR2600-T

List price $599.95/**CE price $299.95/SPECIAL**
10 Meter Mobile Transceiver • New Features
The new *President* HR2600 Mobile 10 Meter Transceiver is similar to the *Uniden* HR2510 but now has repeater offsets (100 KHz.) and CTCSS encode.

BC760XLT
800 MHz. mobile scanner
SPECIAL!

★★★ Uniden Cordless Telephones ★★★

XE750-T *Uniden* Cordless Phone with speaker $99.95
XE550-T *Uniden* Cordless Phone..... $79.95
XE300-T *Uniden* Cordless Phone..... $69.95

★★★ Extended Service Contract ★★★

If you purchase a scanner, CB, radar detector or cordless phone from any store in the U.S. or Canada within the last 30 days, you can get up to three years of extended service contract from Warrantech. This service extension plan begins *after* the manufacturer's warranty expires. Warrantech will perform all necessary labor and will not charge for return shipping. Extended service contracts are not refundable and apply only to the original purchaser. A two year extended contract on a mobile or base scanner is $29.99 and three years is $39.99. For handheld scanners, 2 years is $59.99 and 3 years is $79.99. For radar detectors, two years is $29.99. For CB radios, 2 years is $39.99. For cordless phones, 3 years is $34.99. Order your extended service contract today.

OTHER RADIOS AND ACCESSORIES

BC55XLT-T *Bearcat* 10 channel scanner $114.95
BC70XLT-T *Bearcat* 20 channel scanner..... $159.95
BC175XLT-T *Bearcat* 16 channel scanner $156.95
R2066-T *Regency* 60 channel scanner..... $149.95
R1099-T *Regency* 45 channel scanner..... $109.95
TS2-T *Regency* 75 channel scanner..... $269.95
UC1 1/2-T *Regency* VHF 2 ch. 1 Watt transceiver... $114.95
BP85-T *Regency* 16 amp reg. power supply..... $179.95
BP200S-T1 Ni-Cad batt. pack for BC200/BC100XLT... $39.95
B8-T 1.2 V AA Ni-Cad batteries (set of eight)..... $17.95
FBE-T Frequency Directory for Eastern U.S.A..... $14.95
FBW-T Frequency Directory for Western U.S.A..... $14.95
RFD1-T Great Lakes Frequency Directory..... $14.95
RFD2-T New England Frequency Directory..... $14.95
RFD3-T Mid Atlantic Frequency Directory $14.95
RFD4-T Southeast Frequency Directory..... $14.95
RFD5-T N.W & Northern Plains Frequency Dir. $14.95
ASD-T Airplane Scanner Directory..... $14.95
SRF-T Survival Radio Frequency Directory $14.95
TSG-T "Top Secret" Registry of U.S. Govt. Freq.... $14.95
TTC-T Tune in on telephone calls..... $14.95
CBH-T Big CB Handbook/AM/FM/Freeband..... $14.95
TIC-T Techniques for Intercepting Communications ... $14.95
RRF-T Railroad frequency directory $14.95
EEC-T Embassy & Espionage Communications.... $14.95
CIE-T Covert Intelligence, Elect. Eavesdropping ... $14.95
MFF-T Midwest Federal Frequency directory..... $14.95
A50-T Magnet mount mobile scanner antenna..... $35.95
A70-T Base station scanner antenna $35.95
A1300-T 25 MHz.–1.3 GHz Discone antenna..... $109.95
USAMM-T Mag mount VHF ant. w/ 12' cable $39.95
USAK-T ¾" hole mount VHF ant. w/ 17' cable $35.95
Add $4.00 shipping for all accessories ordered at the same time. Add $12.00 shipping per radio and $4.00 per antenna.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CEI*** of any scanner, send or phone your order directly to our Scanner Distribution Center." Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CEI is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. CEI warehouse in Ann Arbor, Michigan. No COD's. Most items listed have a manufacturer's warranty. Free copies of warranties on these products are available by writing to CEI. Non-certified checks require bank clearance. Not responsible for typographical errors.

Mail orders to: Communications Electronics," Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $12.00 per scanner for U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are two times continental U.S. rates. If you have a Discover, Visa, American Express or Master Card, you may call and place a credit card order. 5% surcharge for billing to American Express. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, dial 800-221-3475. FAX anytime, dial 313-971-6000. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

Scanner Distribution Center" and CEI logos are trademarks of Communications Electronics Inc.
Sale dates 10/1/89 – 3/31/90 AD #100189-T
Copyright © 1989 Communications Electronics Inc.

For credit card orders call 1-800-USA-SCAN

COMMUNICATIONS ELECTRONICS INC.™

Consumer Products Division

P.O. Box 1045 ☐ Ann Arbor, Michigan 48106-1045 U.S.A.
For orders call 313-973-8888 or FAX 313-971-6000

CIRCLE 121 ON READER SERVICE CARD

Tired of the same old tapes?
Want a better way to practice?
Like to put the fun back in code?

MorseMan Plus™

The premier Morse Code trainer for the IBM-PC
...is the answer!

MorseMan **Plus** is absolutely the best PC-based Morse Code trainer available! It is easy to use and runs on any IBM-PC or compatible with 512k of memory. It will teach the newcomer Morse Code, using tried and true methods and practice the experienced ham at any speed between 5 & 99 wpm. ***MorseMan*** **Plus** features a random character generator, a random word generator & allows you to send any ASCII text file. Also, ***MorseMan*** **Plus** will send realistic, true random callsigns, with user adjustable options that allow the speed and frequency to vary with each call - sounds like listening to a pile-up!

MorseMan **Plus** will also send **true random FCC-type QSO's (over 20 trillion possible!)**, quiz you on what you have heard and keep track of your progress, just like the exam. Or you can choose to just listen to realistic random two-way QSO's, one after another, with the option to allow varying speeds and tones, just like listening to HF! ***MorseMan*** **Plus** will even let you save everything that it sends (random code, callsigns, QSO's, everything!) to a disk file, so you can document what you hear or make code tapes and have a record of what's on them! ***MorseMan*** **Plus** even features CPU independent timing, so you don't have to fool around with setting the program for your computer - it will do it for you!

Unlike other CW trainers, ***MorseMan*** **Plus** was designed by a CW expert (NE4L) who knows what it takes to get to that high level of proficiency. But the best feature about ***MorseMan*** **Plus** is it's price. **For just $19.95 (reg. $24.95) you can get the most advanced trainer availble and you also receive the next major update free when it is released as well as full user support and membership on our BBS!** If you want to get licensed,upgrade or just just enjoy CW, ***MorseMan*** **Plus** is the way to go! Give it a try and you'll agree that ***MorseMan*** **Plus** is absolutely the best PC-based Morse trainer available!

Three Ways to Order: (1) TOLL FREE with Visa/MC call 1-800-525-7235 (9-4:30 CST M-F) - **(2)** via our BBS (24hrs): (205)757-1348 or **(3)** send Check/MO for $19.95 (+$2.00 s/h)

renaissance development
box 640 - Killen - Alabama 35645

CIRCLE 14 ON READEP SERVICE CARD

PERFORMANCE AND VALUE WITHOUT COMPROMISE

KRP-5000 REPEATER

2 METERS-220-440

The first choice in
Transmitters - Receivers
Repeaters
Repeater Controllers
Power Amplifiers
Voice Mail Systems

CIRCLE 295 ON READER SERVICE CARD

NEED BATTERIES? CALL THE EXPERTS

E.H. YOST & CO.
7344 TETIVA RD
SAUK CITY, WI 53583
(608) 643-3194
FAX (608)643-4439
ASK FOR FREE CATALOG

EVERETT H. YOST KB9X1

We have batteries for commercial, amateur radio, computers, tools, phones and more.

—INTRODUCING—

Our High Powered ICE PACK for your ICOM
COMPARE OUR PRICE & VALUE

ICOM	OUTPUT	mAh	PRICE	ICE PACK	OUTPUT	mAh	PRICE
BP-7	13.75	490	$69.95	IC-12	12.5V	700	$69.00
BP-8	8.4	800	$69.95	AF-10	9.6V	800	$54.00
N/A	—	—	—	IC-10	9.6V	1000	$61.00

—NEW—

ICOM 8 cell Alkaline/NICAD battery pack $23.00

—REPLACEMENT BATTERIES—
FOR ALL YOUR NEEDS
Nickel Cadmium, Alkaline, Lead-acid, Lithium, Mercury, etc.

CIRCLE 114 ON READER SERVICE CARD

UNADILLA ANTENNA MANUFACTURING CO.

PO Box 4215 BV•Andover•MA•01810
(508) 475-7831 9am-5pm EST•(508) 474-8949 24HR FAX

W2AU (1:1 & 4:1)

THE **BIG**® SIGNAL
Amateur Antenna Baluns

W2DU (HF & VHF)

For over 20 years, preferred by Amateur, Commercial and Military Operators. Assembled with all stainless steel hardware and built-in lightning arrester minimizes your TVI, maximizes your power.

Transformer Baluns
For medium power (1000 watts RF minimum) and broadband operation 3–40 MHz.

W2AU 1:1	W2AU 4:1
50/50 or 75/75Ω Dipoles, V's Beams, Quads	200/50 or 300/75Ω Hi-Impedance Antenna (ie: Folded Dipoles)

Non-Transformer Baluns

W2DU-HF		W2DU-VHF
1.8–30 MHz		30–300 MHz
3000–9000 W	w/1:1 SWR	2000–4000 W
1500–5000 W	w/2:1 SWR	1200–2400 W

Contact Your Local Ham Dealer Today!!!

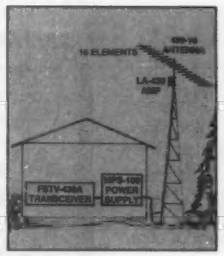
Call or write direct for our informational brochure on our other fine products
Traps•Antenna Kits•Filters•Center Insulators•ENDsulators™•Coaxial Relays
All products come with a 30 Day Warranty

—NOTICE—
We are the NEW manufacturers of the original
JAMES MILLEN™ Products
(508) 475-7831 9am-5pm EST

CIRCLE 136 ON READER SERVICE CARD

INTRODUCING AEA's NEW ATV SYSTEM

Add a new dimension to your amateur radio communications with AEA's Amateur Television (ATV) system. If you hold at least a technician-class license, you can transmit and receive live or taped audio and video Fast-Scan TV (FSTV) information that rivals broadcast quality. Now you can share more than conversation over the air with this new mode of "personal communications."



It's Easy and Inexpensive. If you have a video camera or camcorder and a standard TV set, you may already own the most expensive components of an ATV system. AEA's ATV system includes a transceiver and antenna. Simply connect the camera, TV and the antenna to the transceiver, and you're on the air LIVE with one watt P.E.P.! Your TV set will monitor your transmitted and received pictures. If you want to broadcast with more power, AEA also offers a 50 watt mast-mounted linear amplifier with power supply.

The FSTV-430A Transceiver features a low-noise UHF GaAsFET preamp with a typical noise figure of less than 1.5dB and a crystal-controlled or variable tuning down converter. Output is available on channel 3 or 4 for signal reception AND monitoring transmissions. Two frequencies can be selected from the front panel for transmission (one crystal is included). The AEA design is also optimized for superior videc and audio quality without sync buzz even with weak signals. The FSTV-430A is the only transceiver you need to work ATV and it also allows you to use the same TV set to monitor your transmitted and received pictures.

The LA-430/50 Amplifier with Power Supply gives a boost to your ATV signal. It includes a 50W P.E.P. mast-mounted Linear Amplifier (**patent pending**) covering 420 to 450 MHz and a GaAsFET preamp which utilize the antenna feedline for DC power. The mast- mount eliminates the line loss between the amplifier/preamplifier and the antenna to improve both transmission and reception, and is the equivalent of a 100W amplifier in the shack with a 3dB line loss. The amplifier is housed in a weather-resistant alodized aluminum case. The MPS-100 power supply also provides a 13.6 volt output for the FSTV-430A.

What is the advantage of Vestigial Sideband (VSB)?

AEA's FSTV-430A Vestigial Sideband operation drastically reduces adjacent-channel interference. VSB requires much less bandwidth than existing double-sideband designs; it's the standard method of modulation required by the FCC for all U.S. broadcast TV stations. Similar in principle to SSB, VSB puts all of the audio energy and most of the video in ONE sideband instead of two. Using about half the spectrum space of competitive units, the FSTV-430A is the ONLY ATV unit that conserves spectrum space by using VSB. Even with AEA's LA-430/50 amplifier, one sideband is reduced more than 30dB. VSB presents an obvious advantage to the bandwidth-conscious ATV operator.

The 430-16 Antenna is a high-performance, computer-optimized yagi specifically designed for ATV operation. It features broadband frequency coverage from 420 to 440 MHz, 14.3dB gain, O-ring sealed connectors, 28 degree E plane and 32 degree H plane beam widths and 16 elements on a 10-foot boom.

See AEA's FSTV System at your local authorized AEA dealer. Put yourself in the ATV picture and join the fun!

Advanced Electronic Applications, Inc.
2006-196th St. SW/P.O. Box 2160 Lynnwood, WA 98036 206-775-7373

Prices and specifications subject to change without notice or obligation.
Dealer inquiries invited. Copyright 1989.

AEA Brings You A Better Experience.

CIRCLE 65 ON READER SERVICE CARD

Color SSTV for the Atari ST Part I

Atari ST owners already have 99% of a color video station.

by John W. Langner WB2OSZ

A catchy ad contains a picture with a transceiver, a television, a tape recorder, a missing box, and the caption, "You already own 75% of a color video station." Reading the fine print, you discover that the missing piece costs $1295. It's a very fine and popular piece of equipment, but the price is a bit steep for someone with only a casual interest in trying a new mode of communication.

A few years ago you didn't have much choice. You could either buy a commercial scan converter or home-brew a very complicated device. Very few people had the skill and patience to build it. Modern home computers, though, have lots of memory, plenty of processing power, and adequate color graphics displays to serve as the base for a slow-scan television system. Just add a simple interface and suitable software and you are on the air with SSTV video.

Part I of this two-part article gives you background on the development of amateur SSTV and describes a low-cost SSTV interface and software for the Atari ST computer.[1,2,3] Part II will show you how to build a high performance color SSTV interface for this widely available computer.

Table 1 lists the features of this system. Before continuing, however, let's first look at how SSTV pictures are transmitted.

SSTV Transmission Formats

The original slow-scan television standard uses a tone of 1500 Hz for black, 2300 Hz for white, and frequencies in between for shades of gray. The 120 scan lines are separated by five-millisecond horizontal sync pulses of 1200 Hz. Vertical sync, between frames, is also 1200 Hz, but 30 milliseconds long. Figure 1 illustrates a single scan line.

Early color pictures were transmitted with the frame sequential method. Three separate black and white frames were generated with a red, green, or blue filter in front of the TV camera. On the receiving end, a triple exposure photograph was made with red, green, and blue filters between the CRT and camera. As technology improved, it became feasible to keep all three frames in memory and display them at the same time on a color TV. Figure 2 shows an example with five vertical color bars.

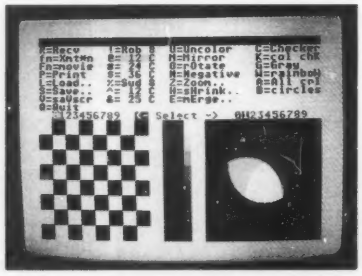

E=Recv I=Rob B U=Uncolor C=Checker
F=Xmtmo B= 12 C M=Mirror K=Col chk
P=Xmtmovie B= 24 C O=rOtate L=Brow
P=Print B= 36 C N=Negative W=rainbow
S=Load.. X=Bug B Z=Zoom.. A=All cpl
S=Save.. ^= 12 C H=sPrink.. B=circles
Q=saVscr &= 25 C E=rEnge..
Quit
0123456789 (C Select => 0123456789

Photo A. Atari ST SSTV test patterns.

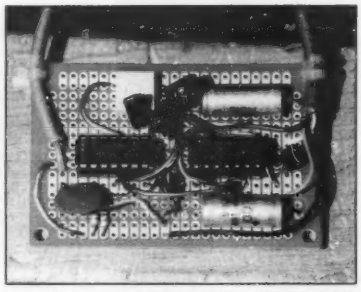


Photo B. Low-cost interface layout.

About a decade ago, several experimenters developed various single frame color schemes. One of the many formats is illustrated in Figure 3.[4] Rather than giving equal amounts of time to the red, green, and blue components, you can use a short transmission time more efficiently by giving more time to green. This is because our eyes are more sensitive to changes in green. The first two-thirds of each scan line is for intensity of green. The remainder is for alternating red and blue information, which is the average of two scan lines.

The Robot transmission formats are different in that they transmit luminance (brightness) and chrominance (color) information rather than red, green, and blue.[5] Luminance, represented by Y, is computed as $0.30\,R + 0.59\,G + 0.11\,B$. Chrominance is conveyed by the two values $R - Y$ and $B - Y$. Table 2 contains luminance and chrominance values for several colors.

The possible ranges of Y, $R - Y$, and $B - Y$ are scaled into the range of 1500 to 2300 Hz for transmission (see Figure 4). At the receiving end, you can calculate original RGB values with a little elementary algebra.

A benefit of this system is that the first two-thirds of each scan line contains a black and white compatible signal. Someone with an old eight-second, black and white system can receive a 12-second color picture properly, and not even realize it was transmitted in color!

Operation

Now that you have a little background and history on SSTV, let's look at the system I've put together. To start with, there are currently two versions of the software. Version 0.9 has the capability to send and receive pictures, manipulate images, generate test patterns, and read picture files from disk. The full version, 1.1, can perform all the functions of 0.9, plus save images to disk. Version 0.9 is available at various user groups. Two groups I know of are: Atari Microcomputer Network, John Adams KC5FW, 17106 Happy Hollow, San Antonio, TX 78232, USA; and ASTUR (Atari ST Users on Radio) GEERAERT Michel, W. Elsschotlann 21, B-8460 Koksijde, Belguim. To the first group, send a formatted disk and $2 for the program; to the second group, send two disks and three IRCs (one disk will be returned).

Version 1.1 is available from A&A Enginnering in Anaheim, California. Version 1.1 is useful only for the high-performance interface, described in Part II of this article, to appear in the January '90 issue.

The screen is divided into several regions (see Figure 5). The top line contains messages, and a prompt for keyboard input, when necessary. The menu contains a list of the available commands. The selection line indicates the currently selected monitor and images. Each "TV monitor" displays an image with 128 by 120 pixels with 256 colors. You can adjust brightness and contrast with the aid of the color bars.

How can 256 colors be displayed at once? In low resolution mode, the ST can normally display from a palette of 16 colors picked from the 512 possibilities. You can increase the number by reloading with a different set of colors during horizontal blanking inter-

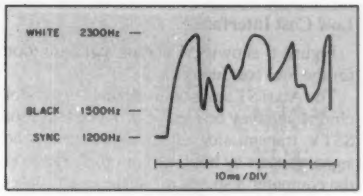


Figure 1. Single scan line plot for the original 8-second black and white SSTV format.

rupts. However, there is still a maximum of only 16 colors on each scan line.

This program uses a different technique. Two different screen images are built in memory. Each has a different palette of 16 carefully chosen colors. During each vertical blanking interrupt, the opposite screen and palette is selected to produce a total of 256 colors. The 30 Hz flicker becomes a little wearing to stare at all day, but it works very well for shorter periods.

Photo A shows the command menu. The first column contains the commands to receive, transmit, print, load from disk, save to disk, and quit from the program. The second column shows the transmission formats. The third column contains functions to manipulate images. The last column contains commands to generate test patterns. The currently selected format is highlighted with a yellow background.

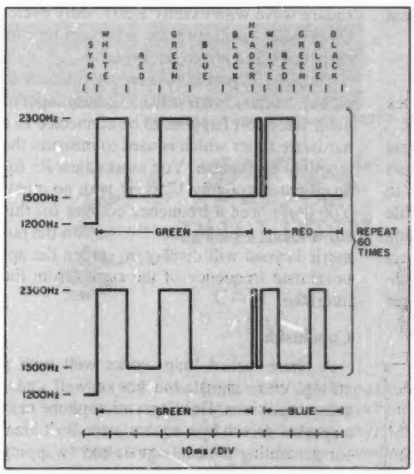


Figure 3. Suding 12-second single frame color format.

Most commands require only a single keystroke. Menu items ending with ".." require additional input. For instance, when saving an image to a disk, you must specify a file name. A flashing text cursor appears along with a prompt for input. While a command is being executed, the menu item is highlighted by a red background. This assures you that you have pressed the correct key. When the background color returns to normal, you know the command has been carried to completion.

At any time, one of the two "TV monitors" is the active or "selected" one. Most of the commands use the content of the selected monitor. Press the left arrow key to select the left monitor. The "<-" on the selection line is then highlighted in red. Press the right arrow key to select the right monitor; "->" will then be highlighted.

The 10 image-buffers in memory are numbered 0 through 9. The TV monitors can display any of the image buffers. A number above the monitor will be highlighted to show which image buffer it's displaying. You can select an image for the currently selected monitor by pressing one of the digit keys, 0 through 9. Press the up or down arrow key to select the next higher or lower image buffer.

There is one more image buffer that isn't displayed on the screen. Commands that modify an image buffer first copy the old image to the save-buffer. The UNDO key exchanges the currently selected image and the saved image.

Sending and Receiving

The first step for sending or receiving is to select the transmission format from the second column of the menu. Press "R" to start receive mode. The first frame will go into the current image. Subsequent frames will go into consecutive image buffers, and the selected monitor will alternate. Terminate receive mode by pressing the space bar.

Function key "n" transmits the current image *n* times. Press the shift key at the same time to transmit consecutive images, once each. For example, if image 6 is in the selected monitor, and you press Shift-F3, images 6, 7, and 8 will be transmitted. Press the space bar to terminate transmission early.

Printing

You can print the image on an Epson or compatible dot matrix printer by pressing "P," for Print. Each screen pixel is converted to a 4 x 4 group of dots on the printer. Each group can have 0 through 16 dots printed, so 17 gray levels are available when viewed from a distance.

Loading and Saving Images

Press "L" to load a picture from a disk file, and "S" to save a picture to a disk file. This program accepts the file formats of the most popular drawing programs. The proper conversion routine is selected by the file extension: NEO for NEOchrome, PI1 for Degas, or STV for its own file format with 256 colors.

"V" saves the entire screen in a file called SCREEN.NEO. You can load this file into memory to transmit a self-portrait.

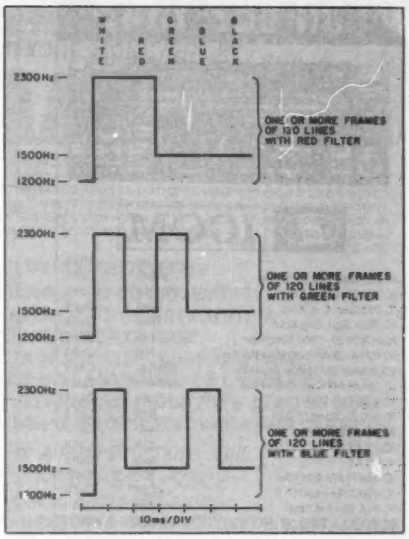

2300Hz
1500Hz
1200Hz
ONE OR MORE FRAMES OF 120 LINES WITH RED FILTER
ONE OR MORE FRAMES OF 120 LINES WITH GREEN FILTER
ONE OR MORE FRAMES OF 120 LINES WITH BLUE FILTER
10ms/DIV

Figure 2. Frame sequential color SSTV. Three b & w frames were sent for red, green, and blue components.

Image Manipulation

You can manipulate the image in a variety of ways. Uncolor (U) converts a color image to black and white so that you can see what a color picture will look like transmitted or printed in black and white. However, you don't have to uncolor a picture before transmitting it in black and white or printing it out. Mirror (M) swaps the left and the right sides of a picture. Rotate (O) turns the image 90 degrees. Negative (N) inverts all the colors: white becomes black, blue becomes yellow, etc.; medium gray is hardly affected.

Zoom (Z) expands one-quarter of the image by a factor of two so that it fills the entire "monitor." At the prompt, type a single digit to select which quarter of the screen you want to expand: 7, upper left corner; 5, center; 2, center bottom; and so on. These positions

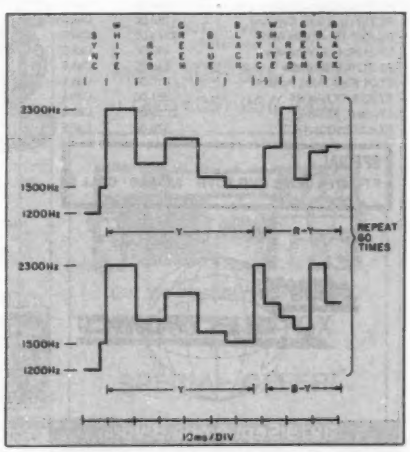
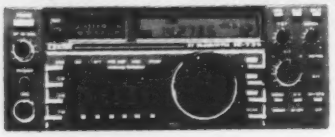


Figure 4. Robot 12-second single frame color format.

800-882-1343



ICOM

	List	JUN's
IC-781 New Deluxe HF Rig	$5995	Call $
IC-765 Gen. Cvg Xcvr	3149.95	Call $
IC-735 Gen. Cvg Xcvr	1099	Call $
IC-751A Gen. Cvg Xcvr	1699	Call $
IC-R7000 25–1300 MHz Rcvr	1199	Call $
IC-R71A 100 kHz-30 MHz Rcvr	999	Call $
IC-228A/H FM Mobile 25w/45w	509/539	Call $
IC-28A/H FM Mobile 25w/45w	469/499	Call $
IC-2GAT 2m 7w HT	429.95	Call $
IC-900 Six Band Mobile	639	Call $
IC-3S AT 220 MHz	449	Call $
IC-2S AT 2M	439	Call $
IC-4S AT	449	Call $
IC-48A FM Mobile 25w	509	Call $
IC-4GAT New 6w HT	449.95	Call $
IC-38A 25w FM Xcvr	489	Call $
IC-32AT 2m/70cm HT	629.95	Call $

SPECIAL	LIST	SALE
IC-20AH	$499.00	$399.00
IC-04AT	$449.00	$299.95

KENWOOD

TS-950SD Multiband	4399.95	Call $
RZ-1 Wideband Rcvr	599.95	Call $
TS-940S/AT Gen. Cvg Xcvr	2499.95	Call $
TS-140S Gen. Cvg Xcvr	949.95	Call $
TM-55AT 2m–70cm 1.2 GHz	469.95	Call $
TS-790A 2m–70cm 1.2 GHz	1999.95	Call $
TS-711A All Mode Base 25w	1059.95	Call $
TR-751A All Mode Mobile 25w	669.95	Call $
TH-215A 2m HT Has It All	399.95	Call $
TH-25AT 5w Pocket HT NEW	369.95	Call $
TM-701A 2m/70cm Mobile	599.95	Call $

DEC. SPECIAL	
TM231A Mobile 50w FM	CALL $$
TM621 2m/220 FM, Mobile	CALL $$
TM731 2m/70cm FM, Mobile	CALL $$
TH75A 2m/70cm HT	CALL $$
TM3530A FM 220 MHz 25w	CALL $$
TS440 S/AT Gen Cvg Xcvr	CALL $$

YAESU

FT-767 GX Gen. Cvg Xcvr	2299.00	Call $
FT-757 GX II Gen. Cvg Xcvr	1280.00	Call $
FL-7000 15m–160m AMP	2279.00	Call $
FT-212RH NEW 2m 45w	499.00	Call $
FT-712RH 70cm 35w	536.00	Call $
FT-290R All Mode Portable	610.00	Call $
FT-23 R/TT Mini HT	351.00	Call $
FT-736R, All Mode	2025.00	Call $
FT-470 2m/70cm HT	576.00	Call $

SPECIAL		
FT-7476X GEN'L CVG XCVR	$889.95	CALL $

JUN'S ELECTRONICS

3919 Sepulveda Blvd.
Culver City, CA 90230
213-390-8003

CIRCLE 272 ON READER SERVICE CARD

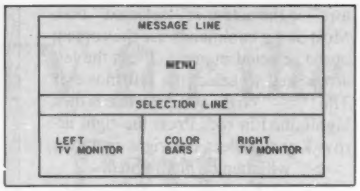


Figure 5. Screen layout for the SSTV program.

Low Cost Interface

Figure 6 shows the station configuration for the low-cost interface.

The Atari ST has a built-in sound generator chip which may be used to produce tones for SSTV transmission. I have received good signal reports by holding a microphone up to the computer's speaker, but the exact placement has a big effect on the resulting signal quality. The computer has no provision for audio input, so you'll need a simple interface for receiving. The schematic is in Figure 7 and the parts list is in Table 3.

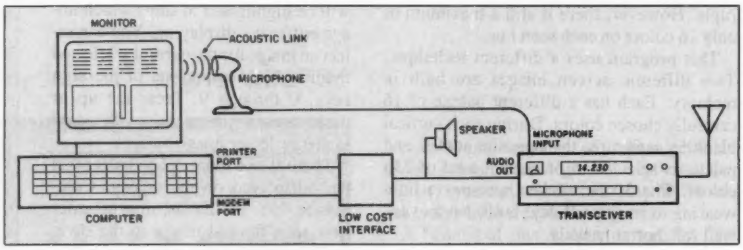


Figure 6. Station layout using the low-cost interface.

conform to the numeric keypad. Shrink (S) does the opposite of Zoom.

Finally, use Merge (E) to combine multiple images into one. Specifying only one source image produces a copy of that image. Not specifying a source image clears the current image buffer.

Pattern Generation

"C" produces a traditional 8 x 8 black and white checkerboard pattern. "K" produces a more colorful alternative. Press "G" for a gray scale pattern, "W" for colors arranged in rainbow order, and "A" to produce 256 rectangles with all the possible colors. Finally, "B" generates overlapping red, green, and blue circles. The intersections of these circles are yellow, cyan, magenta, and white. Again, see Photo A to see the last pattern.

Table 1. Summary of Features

Sends and receives these popular formats:

Robot:	8 second black and white 12, 24 & 36 second color
Volker Wraase:	24, 48, and 96 second color
AVT:	90 second color 24, 94 second color, receive only

Screen contains:
Two images with 128x120 pixels of 256 colors
Menu of available commands

Test pattern generation:
Checkerboard, rainbow, all colors

Image manipulation:
Mirror, rotate, zoom, shrink

Load and save images with various file formats:
NEOchrome, Degas, Own format with 256 colors

Keep ten images in memory for instant access.

Print images with 17 gray levels.

Can use either low cost (about $7) interface connected to modem and printer ports, or high performance interface connected to MIDI port.

U1 is a phase-locked loop which locks onto the strongest tone present. U2 produces a square wave with exactly a 50% duty cycle. Q1 provides protection for the computer; the output of U2 may exceed 5 volts.

The RS-232 port is used only as a source of plus and minus 5 or 6 volts. The busy input of the printer port happens to be connected to a hardware timer which is used to measure the length of each pulse. You must adjust R3 for an output of roughly 1750 Hz with no input. You don't need a frequency counter for this adjustment; pressing the "*" key on the numeric keypad will display on screen the approximate frequency of the signal from the interface.

Conclusion

A phase-locked loop works well with a strong, clean signal, but not so well under noisy conditions. Holding a microphone near a speaker driven by a square wave isn't ideal for generating a clean signal, and swapping

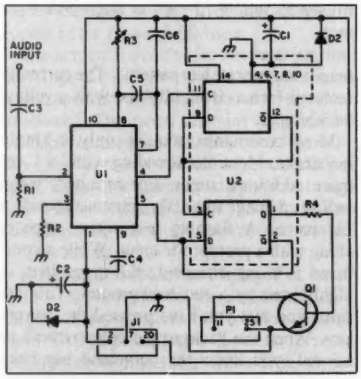
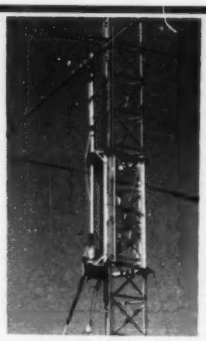


Figure 7. Low cost interface for receive.



ENJOY THE BEST DX

Martin Towers And Hazer

Never climb again with this tower and elevator system. MARTIN TOWERS are made of aluminum and specifically engineered for use with THE HAZER. All bolted construction, no welds. Easy to install hinge base, walk up erection, next plumb with leveling bolts in base. Mount antennas and rotor on HAZER in vertical upright position, then winch to top of tower for normal operating position. Guy wires fasten to HAZER or above HAZER at top of tower. Safety lock system operates while raising or lowering. Never can fall. Photo above shows HAZER midway on tower.

SPECIAL tower package prices include everything but rotor and antenna: 50′ M-18 alum. tower kit form, hinged base, concrete footing section, HAZER kit, Phillystran guy wires, turnbuckles, earth screw anchors, 10′ mast, thrust bearing, tool kit, rated at 15 sq ft antenna load @ 70 MPH, **$1925.95** FOB Boonville.

50′ M-13 alum tower, same pkg as above	$1637.95
40′ M-13 alum tower, same pkg as above	1483.80
30′ M-13 alum tower, same pkg as above	1294.25
HAZER 2 for Rohn 25 - Hvy duty alum. 12 sq ft wind ld	311.95
HAZER 3 for Rohn 25 - Std alum. 8 sq ft wind load	223.95
HAZER 4 for Rohn 25 - Hvy galv stl 16 sq ft wind load	291.95

Satisfaction guaranteed. Call today and charge to Visa, MasterCard or mail check or money order.

GLEN MARTIN ENGINEERING, INC.
Rte 3 Box 322
Boonville, MO 65233
(816) 882-2734 FAX 816-882-7200

CIRCLE 72 ON READER SERVICE CARD

"GUARANTEED TO OUTPERFORM" THE .....OR YOUR MONEY BACK!

HAM 10™ TEN METER HAM ANTENNA

The "Ham 10" ten meter antenna is designed and manufactured by American Antenna, makers of the world famous K40 Antenna. With a power handling capacity of 1500 watts and a band width of 1.5 mhz between 2:1 SWR points the "HAM 10" is the perfect compliment to all single-band ten meter rigs. The stainless steel base of the "HAM 10" is supplied with an adjustable trunk lip mount. Also available is an optional adaptable heavy duty magnamount.

EXCLUSIVE FEATURES:

1. HANDLES UP TO 1500 WATTS!
2. METALPLAS CONSTRUCTION.
3. 30° ROTATION OF BASE.
4. STAINLESS STEEL WHIP AND BASE.
5. MOUNTS ANYWHERE ON ANY VEHICLE!
6. FULLY ASSEMBLED WITH 18′ of RG-58 COAX.
7. COMPUTER DESIGNED ISOLATION CHAMBER.

For A Free Brochure, Call:

1-800-323-5608

IN IL. 1 800-942-8175

....(Or Write) AMERICAN ANTENNA 1500 EXECUTIVE DR. ELGIN, IL 60123

CIRCLE 92 ON READER SERVICE CARD

THE 4SQTRON COMPACT ANTENNAS FROM 160-10 METERS

NO TUNERS!
NO RADIALS!
NO RESISTORS!
NO COMPROMISE!

FOUR EXCELLENT REVIEWS JUST DON'T HAPPEN BY CHANCE
CALL US FOR A FREE CATALOGUE.

*See review in Oct. 73, 1984 *Sept. 73, 1985 March 73, 1986 CQ, Dec. 1988

BILAL COMPANY
137 Manchester Drive
Florissant, Colorado 80816
(719) 687-0650

CIRCLE 42 ON READER SERVICE CARD

Silent Solar Power

The $319.95 Bullet-Tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100w HF station 60 hrs a month. Control circuit speeds charge, protects gel cells & sealed batteries. Fully assembled, QRV, portable. Easily expanded. Add $10 S&H Info $1

AntennasWest
(801)373-8425 Box 50062 Provo UT 84605

CIRCLE 236 ON READER SERVICE CARD

NEWS BULLETIN

CALL US NOW!

YOUR HAM DOLLAR GOES FURTHER AT . . .

CALL OR WRITE FOR SPECIAL QUOTE

When it comes to FAST DELIVERY, HONEST DEALING and PROMPT, DEPENDABLE S-E-R-V-I-C-E back-us We don't just advertise it — WE GIVE IT!

Burghardt INC. AMATEUR CENTER

"AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"

SELL-TRADE

New & Reconditioned

HAM EQUIPMENT

Call or Write Us Today For a Quote!
You'll Find Us to be Courteous, Knowledgeable and Honest

PHONE (605) 886-7314
FAX (605) 886-3444

we'll treat you

SELECTION
SERVICE and SATISFACTION!

In 1937, Stan Burghardt (WØIT), because of his intense interest in amateur radio, began selling and servicing amateur radio equipment in conjunction with his radio parts business. We stand proud of this long-lasting tradition of ***Honest Dealing, Quality Products and Dependable "S-E-R-V-I-C-E"!***

Above all, we fully intend to carry on this proud tradition with even more new product lines plus the same ***"fair"*** treatment you've come to rely on. Our reconditioned equipment is of the finest quality with ***30, 60*** and even ***90-day*** parts and labor warranties on selected pieces. ***And always remember:***

— WE SERVICE WHAT WE SELL —

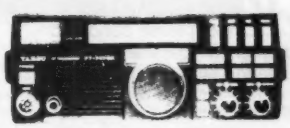
AEA	B & W	Daiwa	Palomar
Alinco	Belden	Hustler	Radio Callbook
Ameritron	Bencher	Kantronics	Ritron
Amphenol	Bird	Kenwood	Rohn
Ampire	Butternut	Larsen	Telex/Hygain
Antenna Specialists	Centurion	MFJ	Ten-Tec
Astron	CES	Mirage/KLM	Unadilla/Reyco
	Cushcraft	Mosley	Yaesu

Write today for our latest Bulletin/Used Equipment List.

STORE HOURS:
9-5 P.M. (CST)
MONDAY thru FRIDAY
OPEN SATURDAYS
from 9-1 P.M. (CST)
CLOSED
SUNDAYS/HOLIDAYS

MasterCard VISA

182 N. Maple
P.O. Box 73
Watertown, SD 57201



Get the most of HF Mobiling

Yaesu FT-747GX

SPECIAL OFFER!

CALL TODAY FOR SPECIAL QUOTE

Table 2. Conversion of RGB to Luminance and Chrominance

Color	R	G	B	Y	R-Y	B-Y
black	0.0	0.0	0.0	0.0	0.0	0.0
dark gray	0.25	0.25	0.25	0.25	0.0	0.0
medium gray	0.5	0.5	0.5	0.5	0.0	0.0
light gray	0.75	0.75	0.75	0.75	0.0	0.0
white	1.0	1.0	1.0	1.0	0.0	0.0
blue	0.0	0.0	1.0	0.11	−0.11	0.89
green	0.0	1.0	0.0	0.59	−0.59	−0.59
cyan	0.0	1.0	1.0	0.7	−0.7	0.3
red	1.0	0.0	0.0	0.3	0.7	−0.3
magenta	1.0	0.0	1.0	0.41	0.59	0.59
yellow	1.0	1.0	0.0	0.89	0.11	−0.89

cables to receive or print is an annoyance. The low-cost interface, however, provides a quick, easy, and cheap way to enter the exciting world of slow-scan television. Stay tuned next month when I describe how to build the high performance interface!

Table 3. Parts list for Low Cost Interface

Part. No.	Description	Quantity	Price
C1,C2	100 µF electrolytic, 10 V	2	@ .19
C3	0.1 µF disc ceramic		.15
C4	0.01 µF mylar		.11
C5	0.001 µF mylar		.06
C6	0.033 µF mylar		.11
D1,D2	1N4001	2	@ .10
J1	DB-25S connector to modem port		.79
P1	DB-25P connector to printer port		.75
Q1	2N3904 or similar		.12
R1,R2	4.7 k	2	@ .06
R3	10 k trim pot		.89
R4	22 k		.06
U1	NE 565, phase-locked loop		.99
U2	CD 4013, dual type D flip flop		.29
	perfboard (RS part 276-150)		.99
	two 14 pin IC sockets	2	@ .39
	Approximate total		$7.00

Prices shown are from a typical mail-order catalog, except where a Radio Shack (RS) part number is listed.

References

[1]Edwards, Jon R., Robinson, Phillip, and McLaughlin, Brenda, "The Atari 520ST." *BYTE*, January 1986, page 84.

[2]Robinson, Phillip, and Edwards, Jon R., "The Atari 1040ST." *BYTE*, March 1986, page 84.

[3]Menconi, Dave, "The Atari 1040ST." *BYTE*, February 1987, page 231.

[4]Suding, Robert W0LMD, "8 and 12 second single-frame color SSTV." *The Best of A5—Slow Scan Television*, page 34. (Reprint booklet number 103 from ESF Copy Services, 4011 Clearview Drive, Cedar Falls IA 50613. $10 plus $1 postage.) Suding formats are not commonly used now.

[5]Robot Research, Inc., *Instruction Book—Model 1200C. Section Nine, "Technical Description." Manual is available separately for $25 from Robot Research, Inc., 5636 Ruffin Road, San Diego CA 92123. Tel. (619) 279-9430. Essentially the same information is in "Upgrade Your Robot 400 SSTV Converter," The Best of A5—Robot 400 Mods*, page 41. ESF reprint booklet 110. Same price as above.

Nets, Newsletters, and Magazines

The **International Visual Communication Association (IVCA)** has four weekly SSTV nets:

North American	Sat. 1500 UTC, 14.230 MHz
South American	Wed. 2300 UTC, 14.236 MHz
European	Sat. 1300 UTC, 14.233 MHz
South Pacific	Sun. 0400 UTC, 14.247 MHz

Another SSTV net, **The Slow Scan TV Network**, meets on Saturdays at 1800 UTC, also on 14.230 MHz. This one tends to have fewer pictures and more technical discussions.

The **Atari Microcomputer Network** meets Sundays at 1600 UTC on 14.325 MHz. This is a good source of information on ham applications for Atari computers. The group also publishes a newsletter called *Ad Astra*. The cost is $15 US or $18 CDN for six issues per year. Those outside US or Canada should add an extra $5 for additional postage. The editor is Gil Frederick VE4AG, 130 Maureen Street, Winnipeg, Manitoba R3K 1M2 CANADA.

The **United States ATV Society (USATVS)** publishes *The Spec-Com Journal*. This is primarily oriented toward fast-scan TV, but there is usually some mention of SSTV. Cost is $20 for six issues per year. Add an additional $5 for mailing to Canada and Mexico, and $10 for other countries. A net is held each Tuesday night at 2000 Eastern time on 3.871 MHz. The Spec-Com Journal, P.O. Box H, Lowden IA 52255-0408.

The **British Amateur Television Club (BATC)** publishes the quarterly *CQ-TV* magazine. Annual membership is £6. For a membership application, send an SASE to Dave Lawton G0ANO, 'Grenehurst,' Pinewood Road, High Wycombe, Bucks HP12 4DD ENGLAND. The US representative is Wyman Research, Inc., R.R. #1 Box 95, Waldron IN 46182. Write for information about current rates in $ US.

An announcement of a new magazine appeared just as I was putting the finishing touches on this article: *Amateur Television Quarterly*, 1545 Lee St., Suite 73, Des Plaines IL 60018. A subscription costs $15 per year. (Add an additional $5 for postage to Canada or $10 for other countries.)

ASTUR has a newsletter which is available only on disks. Cost is two disks (one will be returned) and a few IRCs. ASTUR (Atari ST Users on Radio), GEERAERT Michel, W. Elsschotlann 21, B-8460 Koksijde, Belgium.

The performance of your system depends upon the antenna it drives.

Drive A Winner – Hustler.

Yes, please send information on your line of amateur antennas to:

NAME _____

ADDRESS _____

CITY STATE ZIP

HUSTLER®

One Newtronics Place
Mineral Wells, Texas 76067
(817) 325-1386

CIRCLE 269 ON READER SERVICE CARD

NextDay QSLs
Two-Color Rainbow Assortment
Call Today &

Baraboo, Wisconsin Sauk County	We Ship	NextDay	2nd Day	ASAP
K9ZZ	100	$29.95	$24.95	$19.95
	200	$39.95	$34.95	$29.95
	400	$49.95	$44.95	$39.95
	500	$54.95	$49.95	$44.95
Info $1	1000	$99.95	$89.95	$79.95

AntennasWest (801) 373-8425
All orders ppd 2nd day air / priority mail. For overnight air delivery add $10.
Box 50062-S, Provo UT 84605

CIRCLE 89 ON READER SERVICE CARD

PAY TV AND SATELLITE DESCRAMBLING
NEW . . . 1989 EDITION . . . NEW
The newest systems, parameters, turn-ons, harassment, and countermeasures being used by and against cable, wireless, and satellite operators. New original information $15.95. Pay TV Vol. 1 $14.95. Volume 2 $12.95. Experiences with VC $12.95. MDS/MMDS Handbook $9.95. Build Satellite Systems Under $600 $12.95. Any 3/$28 or 6/$42. Scrambling News Monthly $24.95/yr. Sample $3. Scrambling News Year 1 (200 pages) $22.95. FREE New Fall Catalog!
Scrambling News, 1552A Hertel Ave., Buffalo, N.Y. 14216 COD's 716-874-2088

CIRCLE 36 ON READER SERVICE CARD

RC-1000 REPEATER CONTROLLER
From Micro Computer Concepts
• Repeater Control • Autopatch
• Complete RX-TX-Phone Line Interface
• Intelligent CW ID • Auxilary Output • Easy to Interface • Remote Base/Tape • Reverse Patch • Tailbeeps • 12 V AC/DC Operation • DTMF Decoder with Muting • Telemetry Response Tones • Programmable COS Polarities • Detailed Application Manual with schematics • 90-Day Warranty
Wired & Tested w/manual $239.95
Distributed by:
Communication Concepts
508 Millstone Dr. / Xenia, OH 45385
MasterCard 513-426-8600 VISA

CIRCLE 348 ON READER SERVICE CARD

GIVE YOUR EARS A BREAK!

• Auto-Kall AK-10 XMAS SPECIAL!
• Complete ready to use DTMF selective calling unit
• Use with FM or AM transceiver, scanner, etc.
• Built-in speaker • Automatic speaker reset
• Easy programming with switches • Call light
• Unrestricted 3-digit code, all 16 digits • Wrong number reset
• 12 VDC mobile or base with 117 VAC power pack (included)
MoTron Electronics
310 Garfield St.
Eugene, OR 97402
VISA MasterCard $89.95 $99.95
($3.00 Shipping/ Handling U.S.A)
Call Toll Free 1-800-338-9058 or (503) 687-2118
FAX: (503) 687-2492

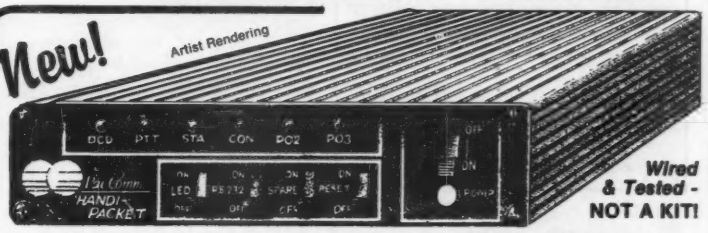
CIRCLE 127 ON READER SERVICE CARD

Measure Up With Coaxial Dynamics
Model 81000A RF Directional Wattmeter
Model 81000A is a thoroughly engineered, portable, insertion type wattmeter designed to measure both FWD/RFL C. W. power in Coaxial transmission lines. 81000A is comprised of a built-in line section, direct reading 3-scale meter protected by a shock-proof housing. Quick-match connectors, plus a complete selection of plug-in elements, gives the FRONT RUNNER reliability, durability, flexibility and adaptability with a two year warranty.
Contact us for your nearest authorized Coaxial Dynamics representative or distributor in our world-wide sales network.

COAXIAL DYNAMICS, INC.
15210 Industrial Parkway
Cleveland, Ohio 44135
216-267-2233
1-800-COAXIAL
Telex: 98-0630

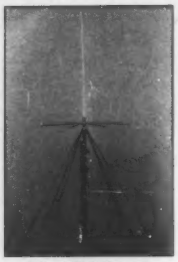
Service and Dependability... A Part of Every Product

CIRCLE 186 ON READER SERVICE CARD

PacComm
• Advanced Technology
• Enduring Value
HandiPacket PORTABLE PACKET CONTROLLER
New!


Wired & Tested - NOT A KIT!
NOW YOU CAN HAVE YOUR PACKET... AND TRAVEL TOO!
★ "Open Squelch" DCD circuitry for faster, more reliable performance ★ Compact size ★ Attaches to your belt, handie-talkie or handheld computer ★ Rugged construction with superb RF shielding (no birdies in your radio) ★ Standard battery pack provides over 12 hours of operation ★ Advanced Personal Mail Box & KISS mode included ★ 32 k-bytes of RAM ★ Complete with belt clip, cables, battery pack & charger, comprehensive manual ★ 30 day money-back / One year warranty parts & labor
NOW ONLY $219.95
Order early in time for Christmas!
For complete info & specifications Call (813) 874-2980 / To Order, Call Toll Free: 1-800-223-3811
Major Credit Cards Accepted!
PacComm • 3652 West Cypress Street • Tampa, Florida 33607
Please send ☐ HandiPacket ☐ More Information ☐ FREE Catalog
Name _____ Call _____
Address _____ Ph# _____
State _____ Zip _____ Card# _____ Exp. Date _____
MONEY BACK GUARANTEE! Add $4.00 shipping/handling per order. FL residents add 6% sales tax. Major Credit Card give number, expiration and signature. FAX: 813-872-8696

CIRCLE 152 ON READER SERVICE CARD

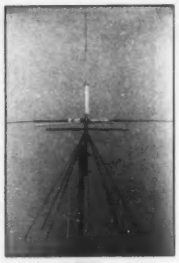


The Wideband SUPERCONE ANTENNA
TX/RX, 10 meter, VHF, UHF and Microwave bands

HOLIDAY SPECIAL
SUPER CONE
$89.95

- ARRL Tested and Approved
- See *73* Review—April '89
- See *Monitoring Times* Review—August '89

PROCOMM
1948 Coventry Court
Thousand Oaks, CA 91362
(805) 497-2397



The SUPERCONE PLUS
TX/RX, HF, VHF, UHF and Microwave bands

CIRCLE 108 ON READER SERVICE CARD

"CHOICE OF THE DX KINGS"

the CUBEX Skymaster FIBERGLASS QUAD KITS

2 ELEMENT—
3 BAND
KIT SPECIAL

ONLY
$289.95
FOB Calif.

CONTENTS
- 8 Fiberglass Arms, 1 pc. White 13 ft.
- 2 End Spiders (1 pc. castings)
- 1 Boom/Mast Coupler, 2" to 2"
- 16 Wraplock Spreader Arm Clamps
- 1 CUBEX QUAD Instruction Manual (Boom and wire not included)

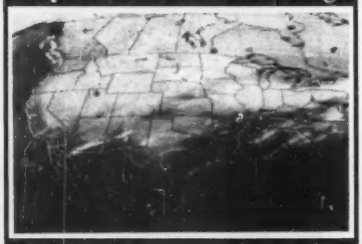
MK III 2 EL COMPLETE "PRE-TUNED" QUAD ONLY $329.95

2-3-4 or more element Quads available. Send 50¢ (cash or stamps) for complete set of catalog sheets, specs & prices

CUBEX COMPANY
P.O. Box 732A, Altadena, California 91001
Phone: (818) 798-8106 or 449-5925

YOU CAN'T SAY "QUAD" BETTER THAN "CUBEX"

Improve Your World Image



PC HF FACSIMILE 4.0 $99

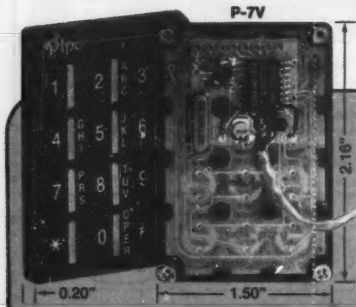
A complete facsimile reception system for the IBM PC or Compatible. Receives up to 16 intensity levels.
Includes:
Demodulator Software Frequency List
80 Page Manual Tutorial Cassette Interpretation Guide
Features:
Print on Epson, or HP Laser Jet
Disk Save, Zooming, Image processing
Unattended Image Capture and much more

PC GOES/WEFAX $250

Designed to receive images directly from U.S. and Soviet meteorological satellites. Includes all of the above feature plus a complete orbital tracking sytem and resolution of up to 256 gray levels.

Software Systems Consulting
1303 S. Ola Vista, San Clemente, CA. 92672
(714)-498-5784

CIRCLE 250 ON READER SERVICE CARD



DTMF/steel keys!
sealed gold contacts!

• COLOR: All keyboards come in BLACK. OPTIONAL: Specify DARK BROWN • Contacts are: WATER PROOF/DUST PROOF • Completely self contained - NO RFI • Simple 3-wire connection • Output level adj. • Wide operating range 4 to 18 VDC • Wide temperature range -22° to +160°F • Supplied with instructions, schematic, template & hardware.

P-7V 12 KEY VERT.	$58 *	CALL OR WRITE
P-7H 12 KEY HORIZ.	$58 *	FOR FREE CATALOG
P-8V 16 KEY VERT.	$63 *	*Request quantity pricing

Mail Order To: Pipo Communications® Emphasis is on Quality & Reliability
P.O. Box 2020
Pollock Pines, California 95726
916-644-5444
FAX 916-644-5900

CIRCLE 66 ON READER SERVICE CARD

Number 26 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS (1200 baud, 8 data bits, no parity, 1 stop bit, PH:603-525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I am looking for accessories for my Yaesu FT-101Z such as external VFO, speaker, etc. Persons with anything for sale for the 101Z please write or call with description, condition and price. Also, need any technical information for the Tandy Model 600 laptop computer such as Memory Map, how to access the serial port from BASIC, use of the external disk drive port, and how to use MS-DOS/PC-DOS DEBUG to write library routines for the Model 600 (an 8088 machine like the IBM.) Contact: *Heyward Bozard, Jr. N4VFK, 234 Pinehill Road, N.W., Orangeburg SC 29115, (803) 536-0720/534-5350 (BBS), Compuserve 70270,530/GEnie HBOZARD.*

Wanted: Assembly sheets, parts list, schematics and instructions for Conar Model 400 transmitter. Purchased through National Radio Institute. Will pay copying and mailing cost.
Charles Hall, 495 West 19th, Russellville AR 72801,

I am researching a book on the life and times of Arthur Godfrey. I understand Mr. Godfrey had a very early, unusual call sign. Can anyone tell me what it was? Thank you. Contact: *Lee R. Munsick, 20 Harriet Drive, Whippany NJ 07981-1906.*

I am in need of schematic diagrams of a 150 watt generic switching type power supply used in a IBM XT clone, and also of a 2400 baud generic internal modem (which says BDP, Inc. or Best Data Products as a possible company name on it). Contact: *Marvin Moss W4UXJ, Box 28601, Atlanta GA 30358.*

I need an operating manual and schematic for a Yaesu FT207R. I will pay all associated costs for a copy, or I will copy and return the original. Thank you. Contact: *Don Richmond, PO Box 153, Talcott WV 24981.*

Needed: A schematic and manual for a Hallicrafters Model S-38C. Also, any updates on the ICOM IC-22S, A-B switch and the 145 MZ MOD. I will pay for copying and handling. Contact: *Ted Jenson KE6WF, HCR 58 Box 7-A, Spooner WI 54801.*

Help me please! . . .I need a service manual and diagram for my Atlas 350 XL Transceiver. I will pay for copy. Hoping for your answer as soon as possible. Thank you. Contact: *Paulo Cesar dos Santos PP2 ZD, Rua Osmundo Rodrigues da Cunha,, No. 605, Araguari MINAS GERAIS 38440, Brazil.*

I am in the process of restoring two old Edgecom radios series 3000, and an FMS 24 and FMS 25. I need any service information on these two units and parts descriptions. Contact: *Mike Herman KC9NF, 1549 N. Cicero Ave., Chicago IL 60651, (312) 276-6688 days.*

73 Review *by Pete Putman KT2B*

Mirage D15 70cm Amp

Boost your HT up to mobile power.

Mirage, Inc.
PO Box 1000
Morgan Hill, CA 95037
Price Class: $155

Mirage has added a new "brick" in its extensive line of solid-state power amplifiers. The D15 is intended for general use in the 70cm (420–450 MHz) band and is class AB1 linear biased to facilitate FM, SSB, CW, and even ATV operation.

What makes this particular design different is its simplicity, made possible by the use of a Toshiba S-AU4 power module instead of discrete transistors. The circuit board layout is simplified considerably. RF-sensed keying is used for TX/RX operation, but there is no provision for hard keying. A potentiometer is accessible through the side panel to set the drop-out delay in the SSB mode, while drop-out is instantaneous in the FM mode.

The heat sink and chassis are similar to the B22 and C22 series amplifiers, except that a new slotted cover is used for better cooling. Front panel controls are POWER ON/OFF and SSB/FM MODE. Two LEDs indicate when the unit is in line and when it's keyed up. Incidentally, the D15 does not use an antenna relay, relying instead on diode switching. This makes a lot of sense at this frequency, and the "clunk" of relay contacts pulling in isn't missed.

432.000 MHz		446.000 MHz	
IN	OUT	IN	OUT
0.5 W	0*	0.5 W	2 W
0.65 W	2 W	0.65 W	4 W
0.7 W	4 W	0.7 W	5 W
0.8 W	6 W	0.8 W	8 W
0.9 W	8 W	0.9 W	10 W
1 W	10 W	1 W	13 W
1.5 W	15 W	1.5 W	17 W
2 W	18 W @ 3.0 A	2 W	18 W @ 3.4 A

*There is a sharp "knee" on the 432 range as the power rises from little or no output and quickly soars to 4–5 Watts output. In both cases, the amplifier becomes saturated with 2 Watts of drive.

Table 1. Power input vs. output for the Mirage D15 amplifier.

Mirage states that the amplifier will develop over 15 Watts output when fully saturated with 2 Watts of drive, and that the insertion loss is less than 1.5 dB. (The D15 has no internal preamplifier.) According to the manual, as little as .25 Watts will result in 6 Watts output across the 70cm band, so the D15 would seem to be ideal for hand-held users and ATV enthusiasts with 1 to 2 Watts output available.

Performance

The Mirage D15 was tested with a variable 70cm RF source using two Bird Model 43 meters—one at the input and one at the output. A Termaline resistor was used to terminate the D15. Two 50Ω attenuators were used before the amplifier to ensure linear power output from the 70cm source. Measurements were made at 432.000 MHz and at 446.000 MHz, covering the weak signal, ATV, and FM segments of the 70cm band. See Table 1.

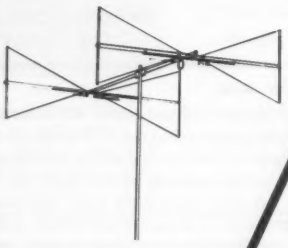
Conclusions

The D15 is a well built amplifier that essentially meets the published specifications for all-mode operation. The workmanship is of excellent quality. The most likely users of this product would appear to be hand-held transceiver owners looking for a bit more power from home or the car, and ATV operators typically equipped with QRP transmitters. While Mirage claims full rated output with an intermittent duty cycle and no cycle times are claimed, I found the output fairly stable during a 3 minute key-up test into a 50Ω load.

CIRCLE 239 ON READER SERVICE CARD

HF ANTENNAS FROM BUTTERNUT

The HF5B "Butterfly"™
A Compact 2 Element Beam
for 20-15-12-10 Meters
Operate As A Di-Pole on 17 Meters



- Unique design reduces size but not performance.
- No lossy traps; full element radiates on all bands.
- Turns with TV rotor
- 19 lbs.

Butternut Verticals

Butternut's HF verticals use highest-Q tuning circuits (not lossy traps!) to outperform all multiband designs of comparable size!

Model HF6V

- 80, 40, 30, 20 15 and 10 meters automatic bandswitching.
- Add-on kit for 17 and 12 meters available now.
- 26 ft. tall

Model HF2V

- Designed for the low-band DXer
- Automatic bandswitching on 80 and 40 meters
- Add-on units for 160 and 30 or 20 meters
- 32 feet tall - may be top loaded for additional bandwidth.

For more information see your dealer or write for a free brochure

BUTTERNUT ELECTRONICS CO.
405 East Market, Lockhart, TX 78644

TOS

ATV

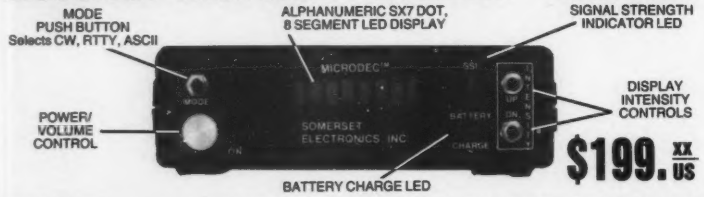
- Complete Monitoring of Video and Audio before and during Transmit.
- FM, AM, or both Modes of operation.
- VU Meters for Audio and Video Monitoring.
- Band Change any time and still use the main Control Unit.
- Low Loss coax is NOT required for any Band.
- Built in White Clipper
- AGC in the MIC Amp.
- SMOOTH TOUCH Control on all Switches.
- Easy to Use
- Many More FEATURES.

Call or WRITE For Full Information

T. D. Systems 6419
6419 Rock Springs
Arlington, Texas 76017
817-483-4994

CIRCLE 28 ON READER SERVICE CARD

Add New Enjoyment to Your SW Receiver with the MICRODEC™ Decoder



$199. XX US

MICRODEC™ converts MORSE, RTTY, & ASCII to ALPHANUMERIC CHARACTERS

- ***Lightweight, rugged construction makes the **MICRODEC** the perfect accessory for your portable receiver. (measures 5" x 4" c 2")
- ***Operates with 9 VDC adapter or any mobile power source from 9–24 VDC. 8 to 12 hour rechargable batteries and charging circuit are also available.
- ***With the RS–232 output to the serial port of your computer and using standard communication software the **MICRODEC** will display the decoded information on your terminal.
- ***The built in oscillator and your keyer makes the **MICRODEC** the perfect learning tool for morse code. The quality of your sending will be seen directly on the green 8 segment LED display. (Red or yellow also available.)

Comes standard with the RS-232, Key Oscillator and 9 VDC adapter.

Rechargable battery.....$29.95 Red or Yellow display.....$15.
Extended Life Battery.....$49.95 Kits available upon request.

Discover What You've Been Missing!

ORDER—(407) 773-8097—NOW
Money Orders, Certified, and Personal Checks Accepted

SOMERSET ELECTRONICS, INC.
1290 HWY A1A, Satellite Beach, Florida 32937

PC Slow Scan $149.95

A complete slow scan television station for your IBM PC or compatible. Send and receive images in up to 10 shades of gray depending upon your graphics card and printer.

Includes:
Demodulator Modulator 75 Page Manual
Software Tutorial Cassette

Requires:
Ham transceiver PC with 640K Parallel Port
Graphics Card Tape Recorder Serial port

Slow Scan Formats: 8,12,17,23,34,36,48,72 sec.

Software Systems Consulting
1303 S. Ola Vista
San Clemente, CA 92672
(714) 498-5784

CIRCLE 244 ON READER SERVICE CARD

Where's the Beam?
Unobtrusive DX Gain Antennas for 80 thru 10
• Easily hidden • Install Fast • Fixed or Portable •

There's a 20 meter antenna with real DX Punch hidden in this picture. You can't see it, and your neighbors can't either. But it works DX barefoot anyway. How about a low profile 80/40/30 tri-bander? Or a 2 element monobander for the attic? All easily fit the pocketbook–Priced $29 to $99.

Work DX without telling the neighbors

Infopack $1 *AntennasWest*
Box 50062-R, Provo, UT 84605 (801) 373-8425

CIRCLE 5 ON READER SERVICE CARD

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
5712 Stillwell Road
Rockville MD 20851

Apologies

I recently spoke with Tom Moulton W2VY of the Radio Amateur Telecommunications Society (RATS) about my article on networking (pp. 60-62) in the October packet issue of *73*. Tom is the author of the ROSE networking package. He spotted some errors and unclear statements in the article.

First, the ROSE packet switch does not contain an implementation of the OSI transport protocol TP1. Second, the statement, "ROSE can't communicate with NET/ROM, NET/ROM can't communicate with TexNet, and TexNet can't communicate with ROSE," is incorrect. Although they can't intercommunicate on the network level, all these protocols can indeed communicate at the AX.25 level. Users can manually set up a path involving all of these different types of network node as long as they set up the path like KA-Node: by issuing a connect command at each point along the way. Such a network can't switch packets between the different networks automatically.

If you're interested in the ROSE packet switch, and you want more information about it, contact Tom Moulton W2VY at *RATS, 206 North Vivyen Street, Bergenfield, New Jersey 07621; (201) 387-8896.*

A Disturbance in the Ether

Over the past two years many packet radio enthusiasts have had to deal with nasty messages, excessive QRM, and verbal abuse. The complaint? "You (fill in the blank—TCPers, NET-ROMers, TEXneters, etc.) are ruining packet radio for us 'legitimate' users." I have also heard, "My digipeater/NET-ROM is for legitimate packet radio use—not for TCP/IP." How about this one, "That BBS is making it so that I can't have a QSO with Fred (or Jim, or whoever). That *!–&$% BBS owner ought to get his own frequency and quit messing up ours." My personal favorite is, "You can't legally send TCP/IP over the air because it isn't AX.25 and the FCC regs only allow AX.25 packets on the air."

No, It's Not Illegal!

There are really three problems: people who like to monitor everything on the channel and who don't like all the binary "garbage" from the networking protocols; too many people on one frequency; and poor frequency sharing. The first problem turns out to be an oversight on the part of the people who wrote the firmware for early TNCs. Every AX.25 packet contains a field called the Protocol IDentifier (PID). This tells the receiver what kind of data is contained in the packet.

In the early days of packet, everything was sent with the same PID (hex value F0) indicating that the packet contained ASCII text. NET/ROM, TEXnet, TCP/IP, ROSE, and text all use different PID values to differentiate between them. These PID values are part of the AX.25 specification. The monitor mode of many TNCs ignores the content of the PID field, so if you turn your monitor on, you see garbage on the screen or on the printer. The solution is to get a later version of firmware for your TNC or get a new TNC.

This also touches on the complaint that use of TCP/IP, NET/ROM, TEXnet, ROSE, or any other networking or special protocol is unlawful. Not true! Each of the above mentioned protocols uses a technique called encapsulation, i.e., every TCP, NET/ROM, TEXnet, or ROSE transmission is completely contained in a perfectly valid AX.25 frame. All of these protocols are perfectly valid and legal in an amateur packet radio environment, on HF or VHF.

To go one step further, the FCC regulations do not even require an amateur station to send data using AX.25. They only require that the operator maintain a written description of the modulation and encoding techniques used at the station, and that the encoding/transmission method be used to enhance communications and not be intended to prevent others from receiving and decoding the transmissions.

Frequency Crowding

In populated areas, too many people may be on one frequency. A 1200 baud channel can handle only about 700–800 bauds average throughput. When you have several people typing to one another, the channel can handle many users before it reaches saturation, but as you throw in a computer that can type faster than a human, you begin to see problems with channel capacity. The BBS is a perfect example of this.

The answer? Provide more frequencies to divide the load and improve channel sharing. There is a simple reason why most people do not want to move to a different frequency: without a packet switch or BBS on the new frequency, they can't reach the rest of the world from there. On the other hand, trying to cram all the users in one area onto one or two frequencies is pretty crazy, too. Instead of putting up more digipeaters, it would be better to spend the time and money putting up duplex digipeaters (dual-frequency, real-time, digital repeaters) and crossband packet switches.

Obviously, more frequencies will help eliminate overcrowding. There are LOTS of frequencies available for packet. Six meters, 220 MHz, and 70cm (430–450 MHz) are grossly underused. 33cm (902–928 MHz) is virtually unused. 23cm (1.2 GHz) is also underused AND it is one of the bands where Novices can operate.

Efficient Use of Frequencies

Surprisingly, file transfers and BBS operation don't have to monopolize a frequency. Several years ago, I set up three stations on 220. I set station A transmitting a file to station B, B sending a file to C, and C sending a file to A. Here were three stations all engaged in file transfers simultaneously. All three file transfers proceeded concurrently without a hitch. The final result was a channel throughput of about 800 bits per second, and a retry/retransmission rate of about 5%. How did I do it?

The first thing I did to improve performance was to use a duplex digipeater (input on 222.06 and retransmit on 223.66). With a duplex digipeater, there was no digipeater delay, so all transfers proceeded at full speed. The duplex digipeater also made it possible for all three stations to hear one another. This reduced collisions at the digipeater, which meant fewer retransmissions.

Next I took advantage of p-persistent CSMA, using the persist and slottime commands in my TNC, now a standard part of all Kantronics and AEA TNCs. With p-persistent CSMA I was able to greatly reduce the number of collisions caused by two or more stations trying to transmit at the same time (a situation I guaranteed by having several file transfers going at once).

The third thing I did was to use TCP/IP. TCP does several things that AX.25 does not. First, TCP measures the time it takes to get an ACK back for every packet it sends. It keeps a running tally of this round-trip time and sets the retransmission timer (FRACK in AX.25 parlance) to twice the average round-trip time. If there are fewer users and the channel loading is light, the round-trip time is short. If there are many users, or the channel loading is heavy, the round-trip time is much longer. The net result is that TCP does not resend packets unnecessarily.

Another feature of TCP is something called backoff. Every time TCP must resend the same packet, it waits longer. This results in the channel becoming quieter very quickly when there are lots of collisions and lots of lost packets.

Just for fun, I tried the same experiment again and tried establishing an AX.25 connection on the same channel. The file transfers proceeded as before, but the AX.25 station could not keep from timing out and eventually breaking the connection.

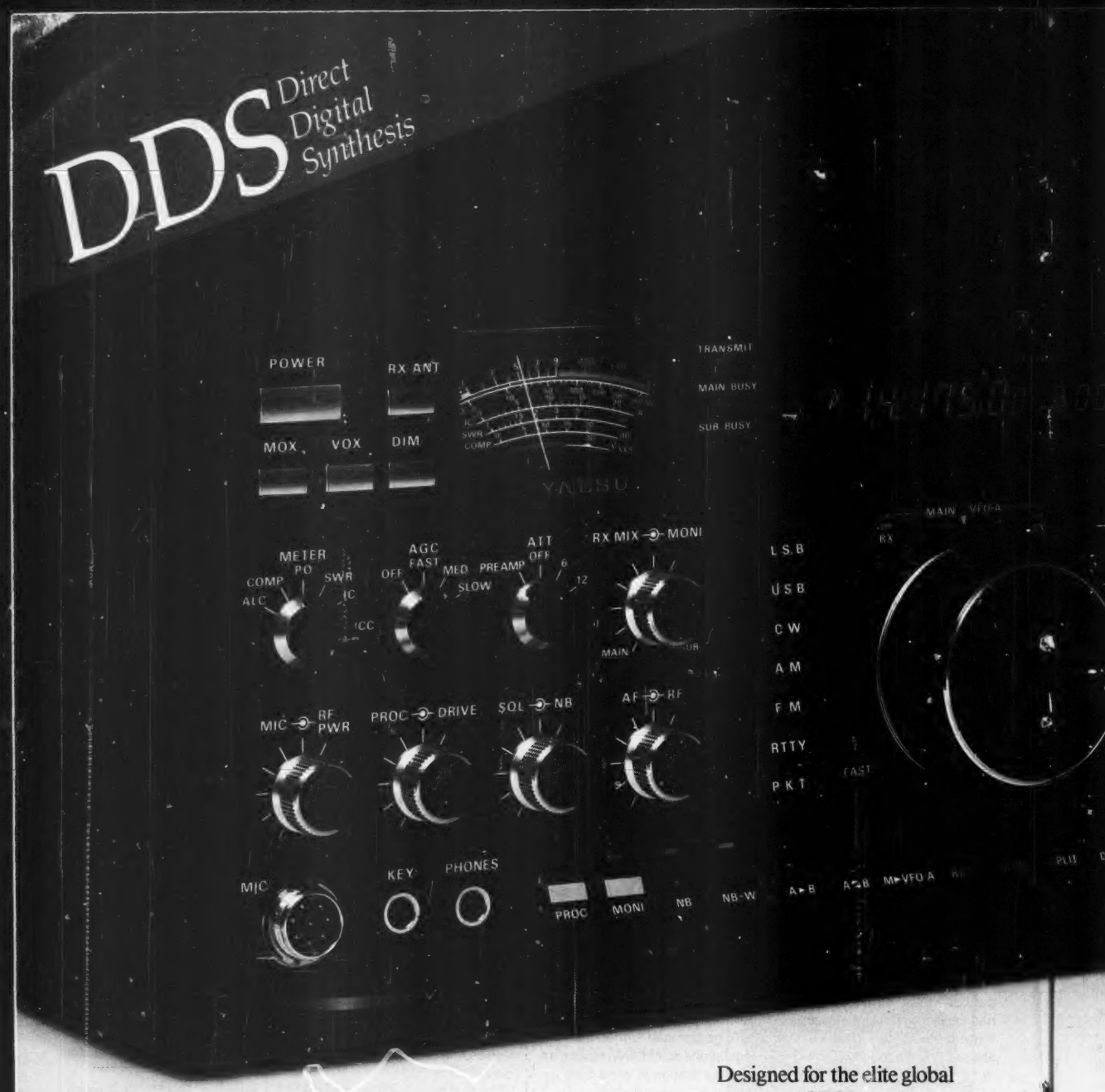
Making AX.25 More Efficient

There are some things that you can do to make your AX.25 operations more efficient and to make your station share the channel more efficiently. First, if your station supports p-persistent CSMA (that is, if your TNC has the persist and slottime commands), use it. Set DWAIT to 0 and set slottime and persist as I described in *73's* Packet issue (October 1989). Set MAXFRAME to 1 so that everybody gets a shot at the channel with every packet.

Lastly, set FRACK to a much bigger number so that your packets will have a chance to get to the receiver, and the ACK will have time to get back.

Consideration

The bottom line is this: packet radio is a hobby, and we owe it to each other to act in a courteous and thoughtful manner. Complaining without understanding will not get anyone anywhere. We owe it to each other to discuss issues rationally, without casting aspersions. 73



Performance. Yours and your radio's. They go hand in hand. To be a truly world-class competitor, you've got to have a truly world-class rig. And it's here, now. The versatile new FT-1000 from Yaesu.

Designed for the elite global contest and DX operators. With state-of-the-art design including **direct digital synthesis (DDS)** for low noise and fast lock-up time. The FT-1000 will blow away your competition with a spectacular combination of power and operating flexibility. This HF transceiver boasts a list of

© 1989 Yaesu USA, 17210 Edwards Road Cerritos, CA 90701 (800) 999-2070

Performance.

features and options that other manufacturers still have on their drawing boards: Like **200 watts RF power output; Built-in TCXO,** for superior frequency stability; **Independent filter selection; Dual receive with balance control** and **two tuning knobs** for simultaneous reception in tough pile-up situations. Using **BPF-1** allows cross-band dual receive.

And the FT-1000 options such as **digital voice-recording system (DVS-2)** for storing and playback "CQ Contest" messages. On RX the DVS-2 has a 16-second running memory for playing back garbled calls. There's also a **CW spot control,** so you can align your frequency to that of an incoming signal without having to transmit; Plus **direct keyboard frequency entry; Front panel RX antenna selector; Built-in cascaded filters;**

And the receiver itself features a **four JFET up-conversion mixer, for high dynamic range.**

This HF rig is the product of three years of intensive research and design. These efforts show in Yaesu's scrupulous attention to detail with features and options ergonomically designed to allow you to achieve a position of competitive dominance. To hear and be heard... Like never before.

See the exciting new FT-1000 at your Yaesu dealer today. It's the best of the best.

YAESU

Performance without compromise.

HOMING IN

Radio Direction Finding

Joe Moell PE KØOV
PO Box 2508
Fullerton CA 92633

T-Hunting Fun on Six Meters

Most hams in the USA think of 2 meter FM when someone brings up the subject of transmitter hunting. But there has been—and still is—lots of hunting excitement on other bands. In my Novice days, HF mobile was the rage, particularly 10 and 75 meter AM. So that's where hams did T-hunting. (Ask me about my trunk-mounted vibrator-powered DX-40 sometime.) Nowadays, inexpensive mobile and portable rigs are available for almost every band, so the possibilities for foxhunting fun are limitless.

Transmitter hunts have been a monthly activity of the Southern California Six Meter Club (SCSMC) for over three years, using 50.300 MHz FM, the local calling frequency. When SCSMC volunteered to put on the hunt for the 1989 ARRL Southwestern Division Convention, the SCSMC officers decided to have one of the three hidden transmitters be on 50.300. Substantial cash prizes created a sudden swelling of interest in 6 meters among serious southern California T-hunt competitors.

Because 6 meters is on the border between HF and VHF, it has some of the characteristics of each. The ground wave is very reliable for local QSOs, but the band opens for great DX via the F layer when sunspot activity goes up. Sporadic E propagation livens things up in the late spring and summer months. As a bonus, there is added excitement from aurora and meteor propagation at times.

Six meters is a very interesting band for transmitter hunting. It most closely resembles 10 meters, but reflections and multipath from hills and other features of the terrain are more likely. Reflections are much less prevalent than on 2 meters, however.

SCSMC holds hunts once a month on Saturday morning. The boundary is a 15 mile radius from the hilltop starting point. The hider must use a vertically polarized antenna and be on the air continuously. The team with lowest mileage from start to finish wins the hunt. Time is not a factor, which encourages safe driving and careful T-hunting techniques.

Despite these restrictions, hiders can still put on challenging hunts because of the varied urban and rural terrain in the area. Transmitting antennas are larger than for 2 meters, but hiders find clever ways to conceal them.

Rigs Are Plentiful

I can hear you saying, "How can I hunt on six? I've never even operated there." Too bad. You've missed some great fun. But you don't have to shell out big bucks to join the action. Look around—you may find you have most of your setup already.

Small battery-powered portable rigs, such as the Yaesu FT-690R, are popular for T-hunting, although the dynamic range of the S-meter is too wide for my taste. Older solid state rigs, such as the Yaesu FT-620, show up inexpensively at flea markets. They work on 12 volts and are easy to modify for an external S-meter, internal attenuator, and other goodies.

"Loop users frequently win the local hunts."

Do you have a scanner in your shack? Chances are good that you can use it for T-hunting. Sony, Kenwood, AOR, Bearcat, Regency and Cobra have scanner models that receive at least part of the 6 meter band and work on internal batteries or an external 12 volt supply. Older commercial handie-talkies for 30–50 MHz by Motorola and RCA are inexpensive and convert readily to 6 meters.

As on other bands, there are several options for 6 meter hunting antennas. The one you choose depends on how you're searching (foot or vehicle), what you're hunting (horizontal or vertical, fixed or moving, weak or strong), and how much effort you want to expend in preparation.

Loops Are Easy

The simplest 6 meter RDF scheme is the loop antenna. As

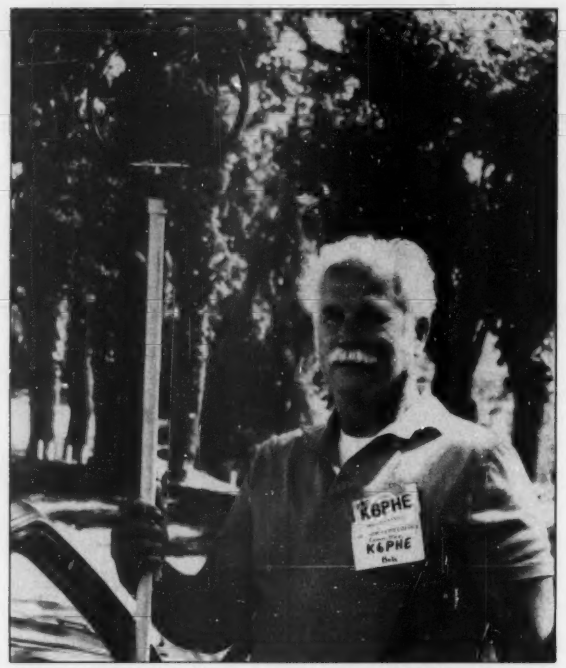


Photo A. Bob Hastings K6PHE uses a 6 meter T-hunting loop on his vehicle and on foot.

regular readers know, I dislike loops on other VHF bands, but small loops perform adequately on 6 meters when there is enough signal strength. Many hunters use them successfully. You can build a competitive loop in just a few minutes.

The loop design in Figure 1 comes from John Wendt WA6BFH. All you need is a 27½-inch piece of RG-11 75Ω coax, two PL-259 connectors, a UHF Tee connector, and adapters to get to your downlead.

Install PL-259 connectors on each end of the RG-11 coax piece, leaving the center conductor connection open on one end. Connect the PL-259's to the Tee to form the loop. Cut the jacket and braid of the RG-11 coax at the exact center (top of the loop), leaving a half-inch gap with the center conductor and dielectric intact.

Cover the gap with black electrical tape and hook the loop to the receiver with a suitable length of RG-58 or RG-8X coax. No tuning is necessary. You will get two sharp nulls (minimum signal points) looking through the loop, exactly 180 degrees apart. Signal peaks will be in the plane of the loop, at right angles to the nulls. The nulls give the most accurate line of bearing. When the signal is too weak to discern the nulls, use the peaks instead.

Mount the loop on a length of PVC pipe or a wooden broomhandle as in the photo. Hold it up over your head when taking bearings, keeping it as far away as possible from the vehicle to avoid distortion of the nulls. Power lines, metal fences, and the like can also cause bearing inaccuracies when they are near 6 meter loops, so stay away from them.

You can hold your loop out the window when mobile, but it's much better to provide a sturdy mount with a 360 degree indicator to give an accurate line of bearing for map plotting and triangulation. For best results in all weather, mount the mast through a hole in the car roof (see "Homing In" for July 1989).

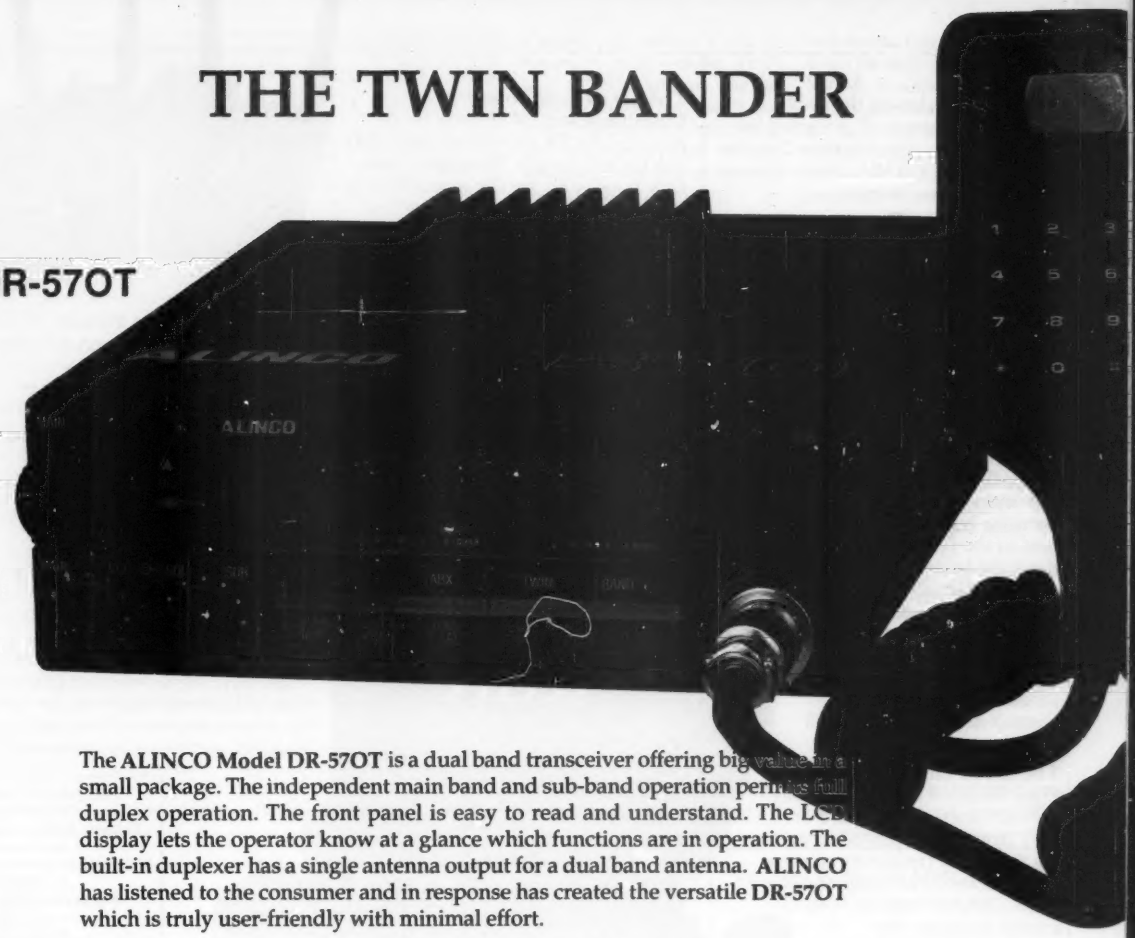
As you close in on the fox, the signal will get so strong that it will fill in the nulls, so you'll need an internal or external RF attenuator capable of at least 80 dB gain reduction ahead of the receiver (see "Homing In" for March 1989).

Ahead or Behind?

I have previously pointed out that the biggest disadvantage of simple loops is their bidirectional patterns. You have to carefully plot bearings and "circle in" on the hidden transmitter with a dual-null antenna, or else you could find yourself going away from the transmitter instead of toward it.

THE TWIN BANDER

DR-57OT



The **ALINCO Model DR-57OT** is a dual band transceiver offering big value in a small package. The independent main band and sub-band operation permits full duplex operation. The front panel is easy to read and understand. The LCD display lets the operator know at a glance which functions are in operation. The built-in duplexer has a single antenna output for a dual band antenna. **ALINCO** has listened to the consumer and in response has created the versatile **DR-57OT** which is truly user-friendly with minimal effort.

- *ULTRA-COMPACT BODY*
  5 7/8" (W) x 2" (H) x 8 1/2" (D)
- *HIGH POWER*
  45 watts on 2M and 35 watts on 70 cm. Approximately 5 watts low power.
- *EXTENDED RECEIVER RANGE*
  (130-169.995 MHz) on 2M, 144-147.995 MHz transmit. 440-449.995 MHz on 70 cm. (transmit and receive)
  (Specifications guaranteed on amateur bands only. Modifiable for MARS/CAP permits required)
- *SIMULTANEOUS*
  Receiving on both bands at the same time
  Scanning: intermix scan modes on both bands at the same time
- *INDEPENDENT*
  The volume, squelch and control dial are independently adjustable on both bands. You can store the following information on both bands at the same time. Priority function, choice of 37 encoding/decoding sub-tone frequencies,call channel, scan function (program, memory channel, VFO or unique open channel scan), memory skip, bell function, + or - repeater shift.

FULL FEATURES

- *FULL DUPLEX CROSS BAND OPERATION*
  Transmit on one band while receiving on the other band -- telephone style.
- *AUTOMATIC BAND EXCHANGE (A.B.X.)*
  When in the ABX function is active, an incoming signal on the sub-band will activate an automatic exchange between the main band and the sub-band.
- *PRIORITY*
  The VFO frequency is monitored for 5 seconds and then shifts for one second to the selected priority channel (In both bands at the same time).
- *DUAL SPLIT SHIFT OPERATION*
  Operates odd offset operation
- *BELL FUNCTION*
- *REPEATER REVERSE FUNCTION*
- *CALL CHANNEL FUNCTION*
- *BEEP FUNCTION*
- *20 MEMORIES (10 FOR EACH BAND)*
  Each memory channel can store frequency, repeater offset, encode/decode frequency.
- *4 SCANNING MODES*
  Program scan, memory scan, band scan and unique open channel scan (opposite to normal busy scan). Scan stops on a busy (or open channel) channel andthen resumes approximately 5 seconds after stopping even if the signal is still present.
- *REPEATER OPERATION*
  The DR-57OT can be used as a cross band repeater.

EASY TO OPERATE FUNCTION

- *LARGE AMBER MULTI-FUNCTION LCD DISPLAY*
  Visible in all conditions, it indicates main and sub-band frequencies, frequency step, "on air", "call", "CTCSS", "PRI", "REV", "-", "+", "*", "T" (tone), tone frequency, "MUTE", "LOCK", "ABX", "♪", "BUSY", "F", "S/RF meter", "REV"
- *MHz FUNCTION FOR BOTH BANDS*
  One MHz is increased or decreased per touch
- *SELECTABLE DUAL AND SINGLE BAND OPERATIONS*
  One touch selection with pressing of twin key
- *SELECTABLE BAND MODE (MAIN/SUB)*
  One touch selection with pressing of band key
- *ILLUMINATED FRONT PANEL CONTROLS*
- *16-KEY DTMF MICROPHONE*
  With memory channel and frequency change up/down buttons.

ALINCO

ALINCO ELECTRONICS INC.
20705 S. WESTERN AVE., SUITE 104
TORRANCE, CALIFORNIA 90501
Tel: (213) 618-8616 • FAX: (213) 618-8758

CIRCLE 67 ON READER SERVICE CARD

Introducing the only compact HT designed for you—Heath's new 2-meter and 450 MHz Micro-Deluxe handheld transceivers.

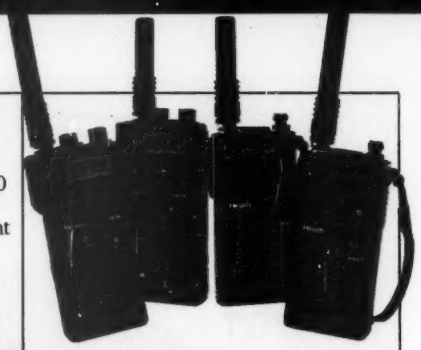
Built with a receiver sensitivity of 0.158 µV for 12 dB SINAD, the micro-sized HW2P or HW4P measures an unbelievable 4-3/8"H x 2-1/16"W x 1-1/4"D. Battery-packs hinge onto the back of the unit so the HT retains the same basic form, even with the largest capacity batteries. Slip it into your pocket or hook it on your belt - no more hassles with bent clips or tangles with car seatbelts. Heath's new micro-HTs will go anywhere you do.

The art of Easy Operation. Enter frequencies directly from the full-function keyboard or QSY from the displayed frequency via the rotary frequency selector. Scan between two frequencies, Scan 1 Mhz or scan all except between two frequencies. Scan favorite memory channels (useful for temporarily locking out a busy channel), scan first ten memory channels, last ten or all twenty. All scanning modes support either Pause Scan (stop on active channel then resume) or Busy Scan (stop on active channel and hold). One button Call channel is a quick way to get to your favorite repeater or simplex frequency.

HW2P shown actual size.

The art of Low Power Consumption. With only 46 mA required for RX squelched, and 1200 mA for full 5 watts TX output, these new handhelds are the most efficient designs available. A nine-step battery saver defaults to 22 mA in receive, but life can be further extended, approaching only 10 mA average RX current squelched.

The art of small talk



The art of 5 Watts Power. With the optional 12V, 600 mA/h battery-pack, the HW2P and HW4P offer full 5 watts out in High, 3.5 watts in Medium and 300 mW in Low. The 7.2 V battery-packs (400 mA/h, 700 mA/h, 1200 mA/h) offer 2 watts in High, 1 watt in Medium, and 300 mW in Low. The 7.2 V, 700 mA/h battery is included standard with the HTs.

Full Line of HT's. Also new are the Heath 2-meter and 450 MHz Mini-Deluxe handheld transceivers. Only slightly larger than the Micro-Deluxe HTs, with all the same exciting features.

Discover the art of small talk, call your authorized Heath dealer about the complete line of Heath HT's and Heathkit station accessories today.

Burghardt Am Center, Waterstown, SD
Delaware Amateur Supply, New Castle, DE
N. Olmsted Am Radio Depot, N. Olmsted, OH
Portland Radio Supply, Portland, OR
RF Enterprises, Merrifield, MN
Ross Distributing, Preston, ID
R&L Electronics, Hamilton, OH
Texas Towers, Plano, TX
The Ham Station, Evansville, IN
VHF Communications, Jamestown, NY

For your free Heathkit catalog, call 1-800-44-HEATH.

Best to start with.
Best to stay with.

Heath Company
Benton Harbor, Michigan 49022

©1989, Heath Company

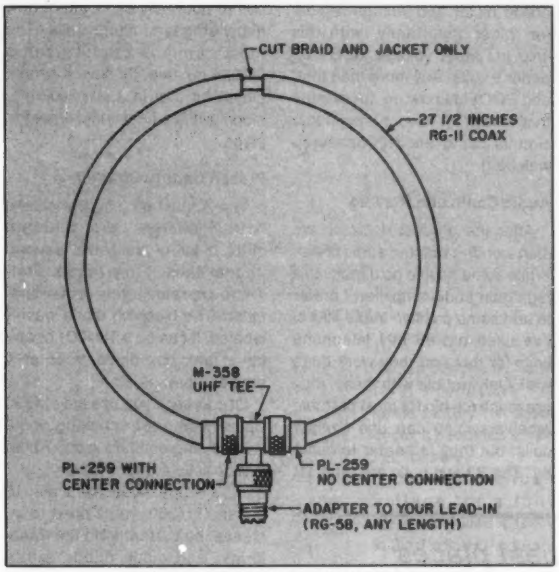


Figure 1. A simple loop for 6 meters.

For mobile hunting, there is a convenient way to resolve the figure-8 problem. A whip antenna mounted on the fender near a corner of the vehicle has a pattern that is unidirectional on some ham bands. Mount a quarter-wave whip on the left rear deck and you'll find that S-meter readings are higher when the hidden T is in front of you and somewhat to the right. The directional lobe is broad, but it's good enough to tell which of the two loop nulls to follow.

This trick may seem crude, but it works quite well for 6 and 10 meters on most vehicles. You'll want a 6 meter whip on your car anyway, so you can talk to the hider. This puts it to another good use. Use a coax switch for rapid selection of the loop or the whip during the hunt.

By the way, standard Hustler HF mobile masts (except for the MO-4) are 56 inches long (without resonators), so they work fine as quarter-wave mobile verticals on six. Another good choice is the Larsen 2 meter ¼-wavelength magnetic mount antenna. The whip is a quarter wavelength on six. It matches quite well without modification at 50.3 MHz.

It's possible to add a "sense" antenna and phase shift network to a loop to resolve the directional ambiguity. The surplus AT-249/GRD and AT-339/PRC units are ready-made RDF antennas incorporating this technique. Both are rugged, easy to use, and cover 47 to 55.4 MHz by design. Unfortunately, they are becoming difficult to locate since T-hunters have discovered their usefulness and snapped them up.

Beginner's Luck?

Despite its lack of sophistication, the simple loop does the job on 6 meters. Loop users frequently win the local hunts. Kevin Kelly N6QAB, an experienced 2 meter hunter, came out on his first 6 meter hunt recently. He used the WA6BFH loop, a whip, a scanner with S-meter, and an external attenuator. His 2 meter hunting experience paid off, because he ended up with low mileage that day.

A loop is by no means the best 6 meter hunting antenna. The small capture area of a fractional wavelength loop makes it much less sensitive than larger antennas. This by itself is not usually a severe problem, because the SCSMC rules require that the hidden T provide a signal that is copyable on loop antennas at the starting point. But if your receiver isn't "hot," you'll want to add a preamp.

There are other good ways to hunt on 6 meters, but there is no more space this month. Next time, I'll tell you how quads and homing RDFs can help you win 6 meter hunts. Thanks to Bob Hastings K6PHE, Gracie Hastings N6FSL, Wil Anderson AA6DD, John Wendt WA6BFH, and all the other SCSMC hunters for their technical assistance and for helping to promote T-hunting on 6 meters. ■

Now receive or leave messages with other local hams using the 16K Bulletin Board featured on the smallest TNC available – the Heath® HK-21 Pocket Packet.

The BBS operates under your call with simple commands like Send or Write a message, Kill a message and read the File messages currently on the system. And the HK-21 Pocket Packet is fully TNC-2 compatible.

Hookup is easy. Plug in supplied cables instantly to most HT's, or wire a separate cable into your mobile or base VHF or UHF rig. Connect your computer via RS-232 and you're ready to call a fast-growing number of packet hams.

The HK-21 Pocket Packet requires only a single 12 VDC@40mA power source or as little as 29mA from an optional HKA-21-1, internally mounted 4.8 volt, 120 mAh, NICAD battery.

The Heath® HK-21 Pocket Packet – $219.95 (Amateur net price)
To order, call 1-800-253-0570

Get your message across... even when no one is listening.

For information on Heath's complete line of amateur radio products call 1-800-44-HEATH for your FREE Heathkit® catalog.

Best to start with.
Best to stay with.
Heath Company
Benton Harbor, MI 49022

FRANKLIN-BELLE PUBLISHERS
The Antenna People Present:

●MAGAZINES●
●*antenneX*—A monthly magazine all about antennas. Read in 40+ countries. 1 year.....$15.97

●BOOKS●
●Rules of the Antenna Game By Ted Hart, W5QJR.....$6.95
●Small High Efficiency Antennas By Ted Hart, W5QJR.....$19.95
●Electronics for the Radio Amateur By James Lee, W6VAT.....$19.95

●SOFTWARE (IBM)●
●Transmitting Loop Antenna CAD By HartSoft.....$17.75
●Transmission Line Antenna CAD By HartSoft.....$17.75

TO ORDER—Send Check or MO plus $1.50 S&H per item (except magazine) Texas residents add 7.5% sales tax, TO

FRANKLIN-BELLE PUBLISHERS
4639 Corona, Suite 12
Corpus Christi, TX 78411
(512) 852-0446

CIRCLE 82 ON READER SERVICE CARD

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

More on Direct Conversion

Although most selectivity in a DC receiver is done in the audio chain, a good solid front end helps. A single tuned front end improves operation a great deal.

A double tuned circuit is even better. Look at the circuits in Figure 1, created by Denton Bramwell K7OWJ, for each one. Values are given for 30 and 40 meters. All the coils are wound with #22 gauge wire. Be sure the leads are long enough to solder to the board. Since this is not going to be a step-by-step construction project, there is no large schematic; rather, what we have are some good add-on circuits.

Radio Shack sells a perfboard with a copper ground plane, ideal for building small receivers or transmitters. It's easy to cut and work with. I've been using it for a good long time, with excellent results.

Product Detection

The input circuit really helps cut down AM detection. It's not a cure-all, but it helps a lot. One of the best places to stop AM detection is in the mixer or product detector. I built a small DC receiver using a 40673 MOSFET. Worked great! The only trouble was that, after dark, when the shortwave broadcast stations came on. Picked them up rather well, all of them, all at the same time. To make matters worse, the circuit was built for 40 meters—broadcast station heaven! So, for only the simplest emergency or portable gear, leave the 40673 in the parts bin. You'll be glad you did.

A singly balanced product detector is the next best. However, you don't see too much of this type of detector around. In most cases, you'll need to use either a matched pair of JFETs or an IC, such as a RCA CA3028A.

You can obtain the best results with a doubly balanced product detector. The detector can be either passive, using diodes, or active, using either transistors or an IC chip. The most common doubly balanced product detector uses hot-carrier diodes. However, for us home-brewers, we can get good results with high speed switching diodes, such as the 1N914s. It's best to get a matching set of diodes. This is easily done with a VOM.

When using a passive detector, we have a conversion loss. Likewise, using an active detector, you may obtain some gain. A diode-ring detector above 30 meters requires an RF amplifier ahead of the detector. Figure 2 shows a working diode-ring detector. In building this, be sure to watch the phasing of the coils. Winding these critters and getting them correct the first time is fun.

If you're not really up to winding a diode-ring product detector, and I can't really blame you, a commercial unit, the Mini Circuits Lab SBL-1 DBM is available. It's not cheap, but it's easy to work with. Radio Kit in Pelham NH (603–635–2235) sells them. Also ask for a catalog from the Small Parts Center, 6818 Meese Dr., Lansing, Michigan, 48911. They also sell them.

A newer circuit on the market, the Signetics NE602, has given rise to a host of DC receivers. This chip, also available from the Small Parts Center, has an on-board oscillator as well as a doubly balanced mixer and voltage regulator. Most importantly, with this chip the input voltage MUST be under 9 volts. Any more than that, and POOF! I know. In the months that follow, I'll have some simple circuits using the NE602. Keep watching.

Audio Chain and Preamp

After the product detector, we start working with the audio chain. While some people go directly to a high gain audio amplifier, I prefer to add some passive audio filters. I've used old 88 mH telephone coils for this and they work quite well. Only trouble with these, they are much too big for most portable receivers. You can use smaller coils, but they're harder to come by. The 88 mH coils are hamfest specials.

"One of the best places to stop AM detection is in the mixer or product detector."

One of the best reasons for using a passive filter is power transfer from the detector to the active audio stages. Also, the filter removes most of the high frequency audio (2–15 kHz) from the high gain audio chain. If you've ever used a pair of those lightweight walk-thing headphones and tuned into a 15 kHz beat note, you will be able to appreciate this filter.

A low noise preamplifier sometimes follows the passive filter. While you can use junk box transistors, and I've used about everything you can think of, a low noise transistor works best.

From the preamplifer, we go to an active audio filter. I don't care for my audio to be super-filtered, so I'm not really picky about how many stages of filters I use. The most common circuit uses a LM324 op amp. I'll have a simple circuit for that in a later column, along with the final audio amplifier stage.

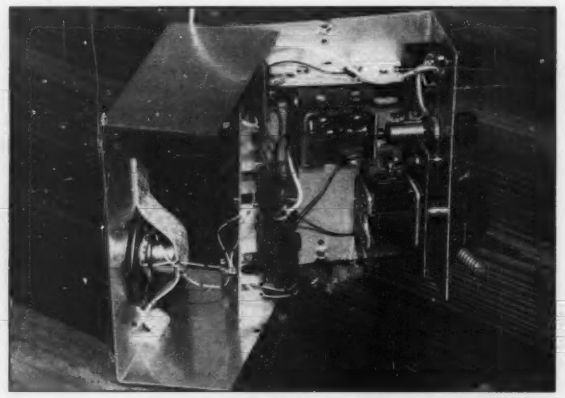


Photo A. A small home-brewed DC receiver.

Pulsed Battery Charger

The August project, the pulsed battery charger, did generate quite a lot of mail and several phone calls. First things first: There are some errors in the schematic. The blocking diode wasn't labeled. It can be a 1N4001 or any other junk box diode rated at 1 amp or more.

Of course, if you use the LM350 with its 5 amp current rating, you'll need a larger diode also. Radio Shack sells a 3 amp diode and, I think, a 6 amp diode. If you plan to use the LM350, you'll need to increase the current from the transformer and diode bridge setup. You'll also need a larger transformer to handle the extra current. Junk box!

The unmarked resistor on the collector of the transistor is 220Ω. The transistor should be a 2N2222 or equal. And last but not least, the 2.2kΩ resistor is shown as a trimmer, which it is NOT. Use a 2.2kΩ resistor and forget about the wiper connection.

Gell Cell Batteries

Aside from the critters making a living in my schematics, most of the phone calls and letters asked about those crazy gelled batteries we all find at the hamfests. I did some digging and came up with a charging manual from the Globe Battery Division on Gel/Cell™ batteries.

According to Globe, the gelled battery likes to be charged using a constant voltage-limited current charging technique. There are also two types of batteries, "A" and "B." Type "A" batteries are used for standby applications. Expect a life of 100 cycles. Applications include intrusion alarms, fire and smoke detectors, uninterruptible power systems, emergency lighting, and computer memory standby power.

Type "B" batteries are for deep-cycle use. According to Globe, a new type "B" battery has an initial capacity of 80–90 percent. After 30–40 complete charge cycles, it reaches its nominal rated capacity. After 200 cycles, the capacity slowly drops. With only minor discharges (40% or less of capacity), you may get up to 1000 cycles. Typical applica-

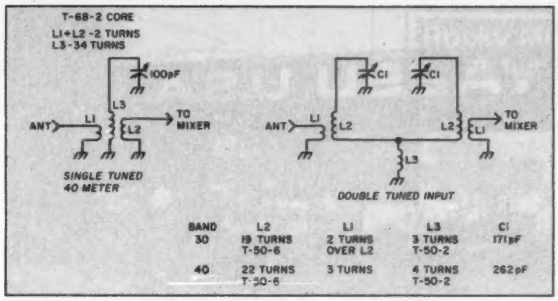


Figure 1. Tuned circuits for DC receivers.

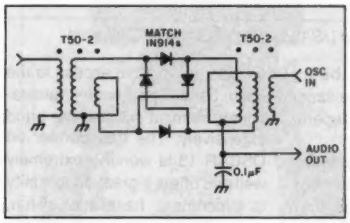


Figure 2. Passive diode product detector. Use matched 1N914s.

tions include TV and radios, video tape recorders, computers, and tools.

As far as I've been able to determine, a battery is type "A" or "B" depending on how you use it. In standby systems, the battery becomes a type "A" battery. If you use the same battery for deep-cycle, it becomes a type "B" battery.

The open circuit voltage for a fully charged gelled battery is 2.12 volts. Of course, the voltage is higher when you first remove the battery from the charger. For a fully discharged battery, the terminal voltage should be 1.75 volts after steadily drawing the current it's rated for after a 20-hour period. You can charge a gel-cell at 2–3 times the rated current. For example, you can charge a 6 volt, 4.5 Ah battery at 7.2 volts (2.4 volts per cell), that is rated at a discharge current of 300 mA, with the charge current limited to between 675 and 900 mA. The battery is fully charged once the charging current stabilizes at a low level for a few hours.

For standby applications in which the battery is operated with continuous charge, as in emergency lighting, for unattended charge a voltage of 2.25 to 2.30 is recommended. For a 6 volt battery this would be 6.75 to 6.9 volts.

For cycle use, optimum recharge time is obtained when a charge voltage of 2.4 volts per cell is used. Our 6 volt battery would require 7.2 volts (2.4 volts per cell x 3 cells). The battery is fully charged when the current drops to a low value. See the table. If you want to keep the battery on the charger, switch to the lower float voltage of 2.25 volts per cell.

Battery Rated Capacity, Amps	Limit Initial Current, Amps	End of Charge Current, mA
0.9 to 1	0.15 to 0.20	10–20
1.5	0.23 to .30	20–40
2.0	0.30 to .40	20–40
2.6	0.40 to .50	30–60
4.5	0.70 to .90	50–100
6.0	0.90 to 1.20	60–120
7.5	1.1 to 1.5	80–160
20.0	3.0 to 4.0	100–300

Table 1. Capacity and initial current vs end of charge current for gelled batteries.

Any Mods?

Since I'm not the only person picking up gelled batteries at the hamfests, I'll have more about these critters next month.

Still looking for mods for the Heath HW-9 for the third edition of the *Hot Water Handbook*. If I use them, you'll get a free copy of the book.

With the weather getting colder, now is a good time for some low-power fun. QRP—better living with less.

(313) 771–4711

Michigan Radio

SALES SERVICE

WE NOW HAVE

*AVAILABILITY subject to change.

*ALL PRICES SUBJECT TO CHANGE

ICOM		List	Sale
IC-781	NEW super deluxe general cvg MOST ADVANCED Rig OUT!!!!!!!	$8149.00	CALL
IC-765	NEW deluxe gnrl cvrg xcvr/ps/at excellent gnrl cvg rig	$3149.00	$2750.00
IC-751A	Gnrl cvrg xcvr/keye /cw filr DXpedition Proven!!	$1699.00	
IC-735	Gnrl cvrg xcvr/QSK compact Big performance/small size!	$1149.00	
IC-725	ULTRA-COMPACT HF RIG	$849.00	$814.95
IC-726	HF/6M TRANSCEIVER	CALL	
R-71A	Hi performance receiver The DXers Choice!!!	$999.00	
R-7000	25-2000 MHz scanning rcvr. The Super Scanner!!	$1199.00	
IC-9000	100 KHz–2 GHz ULTRA-RECEIVER	$5459.00	
IC-228A	THE NEW ICOM 2M 25 WATTS	$509.00	CALL
IC-22JH	THE NEW ICOM 2M 45 WATTS	$539.00	CALL
IC-28A	compact 25w 2m mobile/DTMF mic	$489.00	$380.00
IC-28H	45w version of above	$499.00	$414.95
IC-48A	compact 25w 440 mobile/DTMF	$509.00	
IC-3210	NEW 2M/70CM DUAL-BAND 25w	$739.00	
IC-2400	NEW DUAL-BAND 45/35W MOBILE	$899.00	
IC2500	NEW DUAL-BAND 440/1.2 GHz	$999.00	
IC-275A	Deluxe all mode 2m/ps	$1299.00	
IC-275H	NEW 100w 2m all mode	$1399.00	
IC-375A	NEW 220 all mode/25w	$1399.00	
IC-475A	NEW 70cm all mode/25w/ps	$1399.00	
IC-475H	NEW 100w 70cm all mode	$1599.00	
IC-2SAT	NEW 2M DELUXE MICRO	$439.00	CALL
IC-2GAT	NEW ICOM 2M 7 WATTS	$429.00	CALL
IC-32AT	NEW DUAL BAND HT 2/70	$629.00	CALL
IC-2AT	1.5w 2m synthesized HT	$319.00	$274.95
IC-02AT	2m HT/10 mem/clcss/DTMF 5 watt version w/BP7	$400.00	$349.95
IC-u2xi	micro 2m ht/clcss/DTMF/mems	$329.00	$280.00
IC-u4AT	mini 440 ht/clcss/DTMF/mems	$368.00	
IC-3SAT	NEW 220 MHz DELUXE MICRO	$449.00	
IC-4SAT	NEW 440 MHz DELUXE MICRO	$449.00	

We stock a full line of accessories for the ICOM lines.
Call for information, recommendations and our DISCOUNTED prices!!
(313) 771–4711

YAESU		List	Sale
FT-767	Super xcvr/ps/at/mic accepts modules for VHF/UHF	$2299.00	
FT-757II	New, improved version 757	$1280.00	$969.95
FT-747GX	NEW!! Economy HF XCVR	$869.00	$754.95
FL-7000	AUTO HF SOLID STATE LINEAR	$1775.00	
FT-736R	NEW!! multimode VHF/UHF	$2025.00	
FRG-8800	Gnrl cvrg rx/10 mems/key entry	$784.00	$674.95
FRG-9600	scanning VHF/UHF receiver	$809.00	
FT-470	MINI DELUXE DUAL-BAND HT	$576.00	CALL

FT-411	NEW DELUXE MICRO HT!!	$406.00	
FT-23R/TT	mini 2m HT/DTMF	$351.00	
FT-33R/TT	mini 220 HT/DTMF	$373.00	
FT-73R/TT	mini 440 HT/DTMF	$355.00	
FT-4700RH	NEW DUAL-BAND	$799.00	CALL
FT-211RH	2m 45w autodialer mobile	$449.95	
FT-212RH	HIGH TECH 45w 2M MOBILE	$459.95	
FT-712RH	HIGH TECH 35w 70cm MOBILE	$499.95	

WE STOCK A COMPLETE LINE OF YAESU ACCESSORIES!
CALL US FOR INFORMATION, RECOMMENDATIONS, AND OUR LOW PRICE!!!!!
(313) 771–4711

KENWOOD		List	Sale
TS-950S	Digital DX MACHINE The Ultimate Weapon!	CALL	
TS-940S	Super gnrl cvrg xcvr w/at without at	$2499.95 $2299.95	

COME SEE OUR HOLIDAY SPECIALS

TS-440s	Compact xcvr/99 mems w/at without at	$1449.95 $1249.95	CALL CALL
TS-140s	compact gnrl cvrg xc	$949.95	$819.95
TS-680s	compact gnrl cvrg xcvr WITH SIX METER COVERAGE!!!	$1149.95	$974.95
R-5000	102 db range SW receiver 100 Memory Channels!!	$1049.95	
R-2000	general coverage receiver 10 memories/2 clocks	$799.95	$659.95
RZ-1	500kHz–905MHz REC	$599.95	
TM-253D	25w 2m mobile/DTMF	$499.95	$414.95
TM-2550	45w 2m mobile/DTMF	$519.95	
TM-2570	70w 2m mobile/DTMF	$623.95	
TM-353D	25w 220 mobile/DTMF	$519.95	
TM-701A	AFFORDABLE 2M/70CM MOBILE	$599.95	
TM-731A	2m/440 deluxe dual-band	$729.95	CALL
TM-631A	2M/220 DELUXE DUAL-BAND	$749.95	CALL
TS-790A	TRI-BANDER FOR 2M/70CM	$1999.95	
TH-25AT	MINI 2M SYNTHESIZED HT!!	$389.95	
TH-75AT	MINI DUAL-BAND HANDHELD	CALL	
TH-205AT	2m 3w ht/3 memories	$314.95	$269.95
TH-215AT	2m 3w ht/10 memories/clcss	$389.95	
TH-315AT	220 3w ht/10 memories/clcss	$419.95	
TH-415AT	2 5w 440 ht/10 mems/clcss	$419.95	
TM-231A	45w mobile w/DTMF mic	$459.95	
TM-331A	220 version of 221	$489.95	
TM-431A	35w mobile 440 w/DTMF mic	$489.95	
TR-751A	2m all mode mobile	$899.95	$590.00
TS-711A	Deluxe 2m all mode w/ps	$1059.95	
TS-811A	Deluxe 70cm all mode w/ps	$1285.95	

WE STOCK A COMPLETE LINE OF KENWOOD, ACCESSORIES, RECOMMENDATIONS, AND OUR LOW PRICES
(313) 771–4711

TEN TEC		List	Sale
585 PARAGON	super HF transceiver THE transceiver	$2245.00	$1924.95
562 OMNI V	Deluxe HF transceiver	$2245.00	$1924.95
561 CORSAIR II	HF transceiver	$1445.00	$1239.95

WE STOCK THE FULL LINE OF THE TEN TEC ACCESSORIES-CALL US FOR INFORMATION, RECOMMENDATIONS, AND OUR DISCOUNT PRICES!!!

15000 NINE MILE ROAD, EAST DETROIT, MI 48021

HOURS

TUE WEDS 10-6
THU FRI 10-9
SAT 10-4

CIRCLE 162 ON READER SERVICE CARD

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

It's Fixed!

The Mode S (70 cm uplink, 13cm downlink) transponder is finally working to specifications. Thanks to the efforts of Peter DB2OS, with the aid of ON6UG and G2BFO, the transponder passband can be commanded ON and the telemetry beacon OFF. That's the way it's supposed to work, but until early August it didn't.

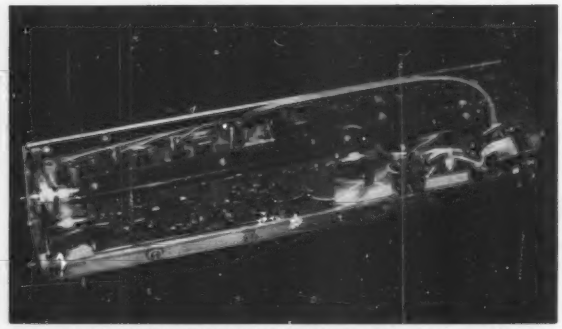


Photo A. The AMSAT-OSCAR-13 Mode S converter, now working well, is just over a foot long.

Mode S transponder designer and builder, Bill McCaa KØRZ, created the device so that either the beacon or the passband could be activated, but not both at the same time. The transponder passband is enabled by a logic line that comes from the satellite's IHU (Internal Housekeeping Unit computer). If the telemetry beacon is on, then the logic line is supposed to turn it off and activate a transistor in the passband electronics.

Until now it wasn't happening that way. Commands were sent with no effect. The beacon signal would stay on and the passband would stay off. As a result, 20 dB more uplink power than anticipated was required to make Mode S contacts. The signals from the ground had to force their way through the deactivated transistor in the passband electronics. Where 1000 watts erp (effective radiated power) might have been fine according to the original design, it actually required more like 100,000 watts erp. Many contacts were made with much less uplink power, but the received downlink was always weak.

A Simple Matter of Timing

A series of tests were performed by Peter DB2OS. Peter is one of the OSCAR 13 ground control stations. By changing the timing of the system commands embedded in the onboard software, Peter was able to achieve a combination that brought the satellite's Mode S transponder passband up while bringing down the telemetry beacon. ON6UG and G2BFO listened to the Mode S downlink frequencies during the tests to keep Peter instantly informed on the effects of his software modifications. The results were dramatic. Hams using less than 100 watts erp CW were able to make quality contacts through the Mode S passband. Thanks to the efforts of Peter and other tireless supporters, we now have a fully functional microwave transponder on an amateur radio satellite.

An Extra "Feature"

While equipment users call glitches in computer systems "bugs," programmers would rather refer to them as "features," not all of which are desirable. When the Mode S passband came online in August, unexpected signals were heard. Apparently a portion of the Mode B uplink passband also appears in the Mode S downlink.

The normal Mode S uplink range is from 435.602 MHz to 435.638 MHz. The corresponding noninverting downlink is from 2400.711 MHz to 2400.747 MHz. Mode B uplink signals on frequencies between 435.480 MHz and 435.516 MHz are also being downlinked on 13 cm in the same band segment with Mode S operators.

Photo B. The Yaesu USA building in Cerritos, California.

Mode S enthusiasts have found this feature an asset with few drawbacks. On the plus side, they can use the Mode B frequencies for uplinking, and be heard on both S and B downlinks. This intrigued Mode B users. The downlinked 2 meter signals are heard on lower sideband, since the B passband is inverting while Mode S is not. The B user can then reconfigure his uplink signals to match the Mode S user and make contact. The S user can then tell the B operator the level of copy on 2400 MHz thus publicizing the existence of an operational Mode S transponder passband.

The downside of the multiple uplink/downlink feature is the competition for space within the rather narrow 40 kHz Mode S passband. The B frequencies which cross to Mode S are very popular. Finding an open spot to operate within the 2.4 GHz downlink can be a problem.

Mode S is a mode that will be with the amateur satellite program as long as we have access to the 13cm band. The Phase 4 geostationary hamsat will use the band extensively. The transponder on OSCAR 13 is working extremely well and offers a great opportunity to experiment, have a lot of fun, and make a lot of contacts. Give it a try!

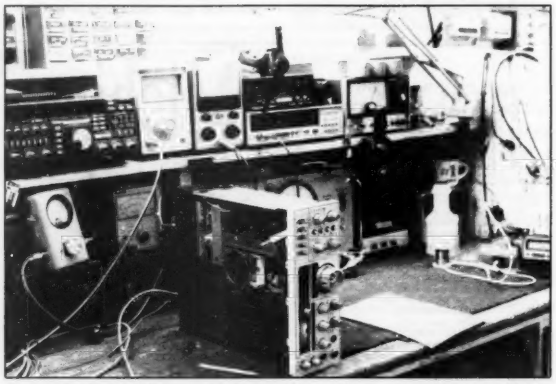


Photo C. One of the many benches for radio repair at Yaesu USA in California.

The "ZRO" Test

The K2ZRO Memorial Station Engineering Award Program, a contest focusing on operating skill and equipment performance, was started a few years ago via AMSAT-OSCAR-10. Named in honor of Kaz Deskur K2ZRO, designer of the Satellite OSCAR tracking

A-O-13 Mode B ZRO Test Schedule

downlink signals on 145.840 MHz

Date	Time
Nov. 25, 1989	2030 UTC
Dec. 2, 1989	1240 UTC
Dec. 16, 1989	2000 UTC
Dec. 30, 1989	1600 UTC
Jan. 13, 1990	1200 UTC
Jan. 20, 1990	1530 UTC

SATELLITE CITY
Communications for the Future

DAN KBØXC — LOUIS KAØIPN
RON NØKMR — DENISE XL MALINEY XL

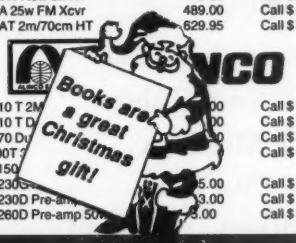
YAESU

FT-		Call $
FT-		Call $
FT-747		Call $
FRG 880		Call $
FRG 9600		Call $
FT 690 R/H	752.00	Call $
FT 790 R/H	681.00	Call $
FT 4700 Dual Band Mobile	799.00	Call $
FT 411 2 Meter HT	406.00	Call $
FT 811 440 HT	410.00	Call $

ICOM

IC-		Call $
IC-		Call $
IC-28		Call $
IC-2GA		Call $
IC-900 Six E		Call $
IC-3S AT 220 M	449.00	Call $
IC-2S AT 2M	439.00	Call $
IC-4S AT	449.00	Call $
IC-48A FM Mobile 25w	509.00	Call $
IC-4GAT New 6w HT	449.95	Call $
IC-38A 25w FM Xcvr	489.00	Call $
IC-32AT 2m/70cm HT	629.95	Call $

KENWOOD



DR-110 T 2M		Call $
DR-510 T D		Call $
DR-570 D		Call $
DJ-100T		Call $
140–150		Call $
ELH-230D	5.00	Call $
ELH-230D Pre-amp	3.00	Call $
ELH-260D Pre-amp 50w	3.00	Call $

CIRCLE 332 ON READER SERVICE CARD

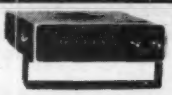
Rocky Mtn. Shortwave
Amateur Specialists
YAESU • TEN-TEC • NRD525 • GRUNDIG
SONY • MAGNAVOX • AMERITRON • MFJ
METZ • ICOM • DAIWA • KLM/MIRAGE
ALPHA DELTA • FAX/RITTY • KENWOOD
WANTED—USED GEAR

Satellit 650

Allied Appliance & Radio
4253 So. Broadway • Englewood, CO 80110
VISA/MC • Discount Prices • $1.00 For List
ORDERS ONLY 800-321-7305
TECH INFO 303-761-7305

SYNTHESIZED SIGNAL GENERATOR

MADE IN USA



MODEL SG-100F $429.95 delivered

• Covers 100 MHz to 199.999 MHz in 1 kHz steps with thumbwheel dial • Accuracy +/– 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • External FM input accepts tones or voice • Spurs and noise at least 60 dB below carrier • Output adjustable from 5-500 mV at 50 Ohms • Operates on 12 Vdc @ ½ Amp • Available for immediate delivery • $429.95 delivered • Add-on accessories available to extend freq range, add infinite resolution, AM, and a precision 120 dB attenuator • Call or write for details • Phone in your order as fast COD shipment.

VANGUARD LABS
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (718) 468-2720 Mon.–Thurs.

CIRCLE 79 ON READER SERVICE CARD

INTRODUCING
THE NEW 10-Hz–1.4 GHz
DATASCAN FREQUENCY COUNTER
FROM B & B INSTRUMENTS

MADE IN THE U. S. A.

COVERS ALL BANDS
160–2 METER
150–220–450
850–1296 MHz

THE ULTIMATE IN
QUALITY – ACCURACY – SENSITIVITY – RELIABILITY

DATASCAN will meet all your frequency measuring needs from mobile, marine, hilltopping and on the bench.

* Delivers years of reliable service, constructed of a rugged all-metal case with 8 digit display.
* Adaptable for any job, operates on 8 AA dry cells*, 11–18 V DC, 110 V AC adapter or with optional nicad pack.
* You can use it to check disc drives, VTR's, TV's, HT's or tune your HF rig to meet a special QSO.
* The C 1400 also comes with a built-in 18 dB preamp for increased sensitivity. You can even add an optional sniffer probe for finding local OSC and multipliers.

Model	Suggested Price	Time Base Accuracy	Sensitivity Typ. 150 MHz	440 MHz	850 MHz	Digit Type Size	1 Hz Resolution	10 Hz Resolution	Inputs	Power Req.	Case Type-Size
C900	139.95	1 PPM TCXO	25 MV	35 MV		8 Digit .4 in. 7 Segment LED	10 Hz to 5 MHz	5 MHz to 512 MHz	BNC 50Ω Pre 1 Meg Dir	117 VAC 11–18 VDC	All Metal RFI Shielded
C1200	169.95	1 PPM TCXO (17°–40°C)	15 MV	25 MV	35 MV	8 Digit ½ in. 7 Segment LED	10 Hz to 5 MHz	5 MHz to 1000 MHz	2BNC 1 Meg Dir	8 AA Dry Cell Batt.	All Metal RFI Shielded Case
C1400	199.95		5 MV	15 MV	20 MV <50 MV @ 1300 MHz	8 Digit ½ in. 7 Segment LED	10 Hz to 5 MHz	5 MHz to 1400 MHz	50Ω Pre	Optional Nicad Pk	2 x 6 x 5

ALL UNITS ARE COVERED BY OUR 5 YEAR LIMITED WARRANTY

ALL MODELS INCLUDE: AC Adapter plus Antenna

ACCESSORIES
BAC-8 8 AA Nicad Pack $19.95
Sp-2 Sniffer Probe (HI-Z) $19.95

SPECIAL $10 WITH ORDER
AM 1200 X10–X100 Audio Multiplier $49.95

ORDER TODAY
(619) 579-2258 or send check or money order to:

DON'T GAMBLE ON YOUR FREQUENCY

TERMS: Shipping, handling and insurance please add 5% ($2.00 minimum) to a maximum of $10.00 each order. CA res. please add 6% sales tax.

*Batteries not included.

manufactured by
B & B INSTRUMENTS
408 La Cresta Hgts Road
El Cajon, CA 92021

calculator and long-time AMSAT supporter, the program tests the listening capabilities of individuals with the best equipment they can bring together for amateur satellite operation.

Since the attitude of OSCAR-10 is no longer controllable, OSCAR-13 is used for the tests. A control station sends and repeats numeric code groups through the satellite's transponder at gradually reduced power levels, starting at a level equal to the general beacon. Participants monitor and record the numbers until they have either copied the 10 wpm CW down to level "Z9" (27 dB below the beacon), or until they can no longer hear the control station's signals.

Those who can hear the satellite's beacon will also be able to hear level "Z0" of the test and qualify for the basic award. The certificate is available through AMSAT-NA. For free verification reports to qualify numbers copied, send an SASE to my address above. The fun comes from upgrading station performance and then pursuing endorsement stickers for the lower power levels. The goal is to encourage stations to improve their downlink reception. Those who hear poorly tend to resort to unnecessary uplink excesses which drain the satellite's batteries and desensitize the satellite transponder for low-power operators.

The Table shows the dates and times of ZRO Tests scheduled for the end of this year and into 1990. They were chosen for coverage, convenience, and optimum operating conditions. The downlink frequency via the Mode B transponder is 145.940 MHz. Other tests will be set up for Mode L with a downlink of 435.945 MHz. You can find the dates and times on the AMSAT HF Nets.

Only a handful of stations have copied and reported accurate "Z9" reception via Mode B. The erp from the Test Control Station is usually less than ONE watt at the "Z9" level. Only superb attention to detail, care in assembling their stations, and a quiet RF environment will allow this kind of receive performance.

But don't wait until you have the "perfect" station to participate. Reports have been received from enthusiasts using many types and sizes of antennas. One operator was on a boat with a 2 meter dipole. Another was in a car with a magmount. Others using simple 4-element yagi antennas, no preamps, and stock radios without exotic filters, have copied signals down to 15 dB below the beacon.

Next time a ZRO Test is on, listen. Just how good is your 2 meter station? How does it stack up with other satellite enthusiasts?

A Look at Yaesu

I was in California recently, at the invitation of Yaesu USA, to participate on their advisory council. As I escaped the incredible traffic of Los Angeles and headed for their location in Cerritos, California, the satellite antennas, aimed at the sky, caught my eye before anything else. A pair of KLM crossed yagis were silently tracking the passage of OSCAR-13. The mirrored front of the 17,000 square foot facility, with over 40 employees, soon blocked my view, but I didn't mind—the new FT-736R, auto-tracking system and RF Concepts amplifier couldn't be far away. Within minutes I was investigating the gear and checking out the orbital predictions.

Chip Margelli K7JA, Yaesu's Vice President of Customer Services, had been tracking the satellite. In addition to his fascination with DX, Chip had caught the hamsat bug. Earlier this year Chip traveled to MV Island between Finland and the Soviet Union to put a new country on the satellite.

Yaesu has been featuring satellite-oriented gear for many years. Prior to the FT-736R and FT-726R, older HF rigs sported optional transverters with extra positions on the band selector labeled SAT. 1, SAT. 2 and SAT.3. With the addition of an extra 10 meter receiver, the HF rig/transverter would become a complete full-duplex satellite station for Modes A (2 meters up and 10 meters down), B (70cm up and 2 meters down), and Mode J (2 meters up and 70cm down). The newer rigs represent the logical progression from years of experience with satellite earth-station functions.

A tour of the building proved fascinating. New rigs ready for shipment in the warehouse, carefully-labeled parts bins for rig repair, and well-organized lab-bench areas occupied most of the complex. Some offices and conference-room areas were on the second floor, but most of the activity was in the sales and customer service section. A new computerized system was being implemented for customer records and ordering information.

If you are in the Cerritos area, drop in. The satellite station is right up front and ready for contacts. 73

Orlando

HamCation©

March 23, 24, 25, 1990

Orange County Convention & Civic Center

Orlando, Florida

▶Free Parking ▶Exhibits ▶Swap Tables

▶Seminars ▶FCC Exams ▶Meetings

Advance registration before February 23rd $7.00 – $9.00 at Door

Swap–Tables....1 or 2 $37.00 each...3 or more $45.00 each.

1 admission included with each table.

Commercial Exhibits (407) 898–1027 • Tables (407) 645–0132 • Tickets (407) 671–6194

Sponsored by The Orlando Amateur Radio Club

P.O. Box 547811 • Orlando, Fl. 32854–7811 • (407) 657–9052

CIRCLE 96 ON READER SERVICE CARD

MFJ gives you *all 9* digital modes

and *keeps on* bringing you state-of-the-art advances

. . . while others offer you *some* digital modes using 3 year old technology

MFJ-1278

$279.95

No 3 year old technology at MFJ!

Using the latest advances, MFJ brings you 9 exciting digital modes and *keeps on* bringing you state-of-the-art advances.

You get tons of features other multi-modes just don't have.

Only MFJ gives you *all 9* modes

Count 'em -- you get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, Navtex and full featured Contest Memory Keyer.

You can't get all 9 modes in *any* other multi-mode at *any* price. Nobody gives you modes the MFJ-1278 doesn't have.

The best modem you can get

Extensive tests in ***Packet Radio Magazine*** prove the modem used in the MFJ-1278 copies HF packet more accurately than all other modems tested.

The MFJ-1278 is the *only* multi-mode with a ***true*** DCD circuit for HF. This dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

Exclusive Built in Printer Port

Only the MFJ-1278 has a dedicated printer port that lets you plug in your Epson or IBM compatible printer.

You don't need to buy an optional $40 cable just to plug in your printer.

20 LED Precision Tuning Indicator

MFJ's unequaled tuning indicator makes it really easy to work HF packet. Unlike others, you use it the same for all modes -- not different for each mode. Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

New Easy Mail™ Personal Mailbox

You get MFJ's new Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

Multi-Gray Level FAX/SSTV Modem

You'll see tomorrow's news today when you copy outstanding FAX news photos with crisp clear details. MFJ-1278 is the *only* multi-mode with a built-in multi-gray level modem. It lets you transmit *and* receive multi-gray level FAX/ SSTV pictures with an appropriate terminal program.

Only MFJ can transmit FAX . . .

Most packet stations can *receive* FAX

But only the MFJ-1278 lets you *transmit* FAX without internal modifications that disable other modes.

So now you can send your own pictures, maps and diagrams by FAX to stations throughout the world.

Too bad they can't send theirs to you . . . *unless* they disable other modes

One FREE Upgrade!

When you buy your MFJ-1278 *today*, you don't have to miss new modes and features that come out *tommorow*.

Why? Because your MFJ-1278 comes with a coupon good for one ***free*** eprom upgrade exchange that'll add new features.

Plus More . . .

Plus you get . . . 32K RAM (not 16K), ***free*** AC power supply, Host mode that lets MFJ-1278 serve as a KISS interface or dumb modem, fast throughput anti-collision technology, independent transmit level for each radio port, random code generator, lithium battery backup, RS-232 *and* TTL serial ports, *standard* 850 Hz RTTY shift, socketed ICs, tune up command, peripheral I/O port, automatic serial numbering, programmable message memories, dual radio ports (*each* HF or VHF), CW key paddle jack, speaker jack that lets you monitor CW sidetone, transmit and receive audio and packet connect bell, ***new*** fully intergrated instruction manual with *Fast Start*™ section and more in a 9½ x 9½ x 1½ inch cabinet.

Get on the air instantly
Just plug it all in

All you need is an MFJ-1278, your rig, any computer and a terminal program.

With an MFJ Starter Pack, $24.95, you just plug it all in, wire up your mic connector and you're on the air.

Order MFJ-1284 for IBM compatibles (includes Picture Passing); MFJ-1287 for Macintosh; MFJ-1282 for C-64/128; MFJ-1283 (tape) for VIC-20.

No Matter What™ Guarantee

You get MFJ's full one year No Matter What™ Guarantee.

That means we will repair or replace your MFJ multi-mode (at our option) *no matter what* happens to it for a full year.

Others give you a *limited* warranty. What do you do when *they* say, "Sorry, your *limited* warranty doesn't cover *that*?"

Get 9 new ways of having fun

Don't settle for 3 year old technology.

Choose the only multi-mode that gives you the latest advances and all 9 modes.

Get 9 new ways of having fun *today!*

MFJ Packet Radio

MFJ-1274 **$159.95**

MFJ-1270B **$139.95**

MFJ-1270B super clone of TAPR's TNC-2 gives you more features than *any* other packet controller -- for $139.95

You can double your fun by operating VHF and HF because you get ***high performance*** switchable VHF/HF modems.

You get the Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

In MFJ's new WeFAX mode you can print full-fledged weather maps to screen or printer and save to disk using an IBM compatible, C-64/128 or Macintosh.

A new KISS interface lets you run TCP/IP. They also come ***NET ROM*** compatible.

You also get 32K RAM and a free 110 VAC power supply (or use 12 VDC).

For dependable HF packet tuning, the MFJ-1274 gives you a high resolution tuning indicator -- and it's only $20 more.

MFJ Video Digitizer

Here's Aimee. This unretouched picture was shot directly from a VGA monitor. We digitized Aimee with a camcorder, MFJ-1292 "Picture Perfect" Video Digitizer and IBM compatible computer.

Create fascinating digitized snapshots to transmit with your MFJ-1278 of *anything* you can point your camcorder at!

The new MFJ-1292 "Picture Perfect" Video Digitizer connects your video camera to your IBM compatible computer so you can capture digitized video snapshots on disks.

You get an easy-to-install plug-in card for your computer, handy contrast and brightness control unit and complete software for only . . . **$199.95.**

You can create your own QSL card from digitized snapshots by using drawing or paint software to add graphics and lettering -- and you can transmit it with included MFJ picture passing software.

You can use your digitized snapshots in any desk-top publishing program that uses the popular PCX format. MFJ-1292 lets you capture pictures in VGA, EGA, CGA, Hercules or Raw Data formats. Get yours today.

MFJ Packet Pictures

Transmit and receive high resolution EGA and CGA color pictures via packet radio with new MFJ picture passing software.

You can set up your own picture bulletin board and exchange pictures with others -- even if you're not there.

MFJ-1288, $9.95, works with virtually any packet controller and IBM compatible computer. It's included ***free*** with MFJ-1284 IBM starter pack and MFJ-1292 Digitizer.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **TELEX:** 53 4590
FAX: (601) 323-6551; Include s/h.

MFJ . . . making quality affordable

© 1989 MFJ Enterprises, Inc.

CIRCLE 86 ON READER SERVICE CARD

SCARED OF THE CODE?
IT'S A SNAP WITH GGTE MORSE TUTOR, THE CHOICE OF THOUSANDS OF HAMS & PROSPECTIVE HAMS, PRAISED IN QST, 73 AND WORLD RADIO! LEARN IN JUST 12 EASY LESSONS!

GGTE MORSE TUTOR

FEATURES OF THIS UNIQUE PACKAGE INCLUDE:
- Code speeds from 1 to over 100 WPM
- Standard or Farnsworth modes
- Adjustable tone frequency
- Over a billion random conversations
- Letters, numbers, punctuation and pro signs
- Random characters & words for each lesson
- Display text while listening or after copying
- All parameters remembered between sessions
- Parameters easily changed when desired

For PC-DOS/MS-DOS computers. Available at dealers, thru QST or 73 or send $19.95 for 5.25" or $21.95 for 3.5" + $2 S&H (CA residents add 6% Tax) to: GGTE, PO Box 365, Dept. MTS, Atwood, CA 92601

HI-PERFORMANCE DIPOLES

Antennas that work! Custom assembled to your center freq. ea. band - advise ht. of center and each end - hang as inverted "V" - horizontal, vert dipole, sloping dipole - commercial quality - stainless hardware - legal power - no-trap, high-efficiency design. Personal check, MO or C.O.D. ($3)

MPD-5* 80-40-20-15-10M max-performance dipole 67' long $105ppd
MPD-2 80-40M max-performance dipole, 80' long 882 ..... 85' 995 ppd
HPD-3* 160-80-40M hi-performance dipole 113' long ..... $79 ppd
SSD-8* 160-80-40-20-15-10M space saver dipole 71' long ..... $125 ppd
SSD-5* 80-40-20-15-10M space-saver dipole-specify L. 42' $105 52' $108 ppd
SLC-4* 80-40-20-15M space-saver dipole-specify L. 66' $93 ... 60' $ 96 ppd
*5-bands with wide-matching-range tuner.

SASE for catalogue of 30 dipoles, slopers, and space-saving, unique antennas

WINNIN ANTENNAS
312-394-3434 BOX 313 MT. PROSPECT, IL 60056

CIRCLE 38 ON READER SERVICE CARD

ANTENNA SOFTWARE
New Releases

MN 2.00 analyzes free-space antennas 2-3 times faster than before, with twice as many analysis segments available. New plotting features enhance pattern shape and detail. Better plot printouts. Analyze almost any antenna made of wire or tubing, in free space or over realistically-modeled earth. Compute forward gain, F/B, beamwidth, sidelobes, current, impedance, SWR, take-off angle, and patterns. Compute the interaction among several nearby antennas. MN includes libraries of antenna and plot files, a file editor, and extensive documentation. $75.

YO 2.00 features a powerful new gain-F/B-SWR tradeoff mechanism, optimization across a frequency band, control of all sidelobes, and full EGA color. Better designs, nicer plots. YO optimizes Yagi designs by automatically adjusting element lengths & spacings for maximum forward gain, maximum F/B, and minimum SWR. YO is extremely fast, and can compute several trial designs per second. YO includes models for gamma, T, hairpin, and beta matches, element tapering, mounting plates, and frequency scaling. A Yagi library, file editor, and extensive documentation are included. $90.

Upgrade from previous versions for $50 & $60. Add 6% for California & foreign orders. For IBM-PC.

Send check or international money order to:
Brian Beezley, K6STI, 507-1/2 Taylor, Vista, CA 92084

G5RV All-Band QuickKits™

Fast & Easy to Build
- Failsafe visual instructions
- No measuring or cutting
- Everything included
- Finish antenna in minutes

Quality Components
- Pressoldered Coax Fittings
- Kinkproof QuicFlex wire
- Fully insulated, wx sealed, no-corrode, low noise design

Fastest Antennas in the West
AntennasWest
(801) 373-8425

- Double Size G5RV 204 ft 160-10 Dipole $59.95
- Full Size G5RV 102 ft 80-10 Dipole $34.95
- Half Size G5RV 51 ft 40-10 Dipole $24.95
- Quarter Size G5RV 26 ft 20-10 Dipole $19.95
- Marconi Adapter kit converts any dipole to Marconi $ 4.95
- 200' Dacron 250# line $11.95

Add $5 Post & Handling Info 51

Box 50062-S, Provo, UT 84605

CIRCLE 107 ON READER SERVICE CARD

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

Thoughts of Dayton

I know it's strange to be writing about the 1989 Dayton Hamvention at this time of year, but then again, we're already more than halfway to the 1990 gathering. Just the other day I found myself writing a letter of confirmation to their program chairman to tell him I would be attending. The Dayton Hamvention is amateur radio's largest and most popular gathering, with well over 30,000 people attending this April event each year. Start making your plans for Dayton now—hotel rooms and plane seats get booked up early!

220 MHz—ICOM Says: Use It!

As far as new gear for the repeater user, my personal opinion is that ICOM stole the show at Dayton '89 with the introduction of the world's smallest full-feature 220 MHz handheld radio. The ultra tiny IC-3SAT weighs a mere 9.9 ounces and measures only 1.9" x 4.0" x 1.2", including its built-in 300 mAh, 7.2 volt battery. And when that power source is expended, you don't have to run to find a rapid charger. Simply connect one of several optional battery packs to the bottom of the transceiver and keep right on operating!

This mini-mite of the handhelds has features that will make you the envy of the local club. These include 48 fully programmable memory channels that store operating frequencies and other information required for repeater operation; a call-channel with the same features; a DTMF encoder for autopatching or control, with 10 DTMF code memory channels of up to 15 digits; receiver full scan, memory scan, memory skip and priority channel watch; up to five watts power out, using a specially designed ultra small high efficiency power module that requires only 13.7 volts DC; and an external power jack that doubles as a charger port for the internal battery.

It also has a feature never before found in a handheld: The IC-3SAT has a built-in clock that lets it double as an alarm clock! The radio can be pre-programmed to turn itself on and off at pre-programmed times to allow you to fall asleep listening in on a late-night QSO and to wake up to the chatter of drive-time, if you so desire!

Options include the UT-49 DTMF Decoder, UT-50 Tone Squelch Unit, and UT-51 programmable Tone Encoder. Availability through factory authorized ICOM dealers was late June. Regardless of what the FCC has in store for 1¼ meters, the amateur radio industry is keeping its commitment. ICOM is showing its commitment to the users of 220 with a new radio that can only be described as astounding for its size and performance.

There is now also a 2SAT and 4SAT available, for 2m and 440 MHz, respectively.

Looking Toward 1990

I have reason to believe that Hamvention '90 will have a new look to it. You might say a younger look because in 1990 the Hamvention hopes to attract some of the younger members of our "New World of Amateur Radio." To do it, they have turned to one of the stars of that show—an energetic 18-year-old college student from Southern California named Kelly Howard N6PNY. And it really does read like a movie script:

Scene 1. A Mexican restaurant in suburban Dayton. It was over dinner, before catching flights home, that Burt Hicks WB6MQV, Nathan Pyle KB6PLH, Kelly and myself joined the Hamvention team for an after-it's-all-over celebration dinner. Kelly struck up a conversation with a number of key Hamvention planners. Among them were General Chairman Bill McNabb WD8SAY, Assistant General Chairman (and 1990 General Chairman) Ed Hillman N8ALN, and DARA Youth Activities Director Terry Falknor N8EEO. Her subject was simple. She wanted to see more young adults in amateur radio, and the astute Miss Howard realized that the Dayton Hamvention is an event that can dazzle the most cynical teenager. It was time for the Hamvention to have a session specifically geared for young people, but not one run by an "old guard" type who is mostly interested in selling Morse code.

Who knows teens better then another teen?, argued Kelly. Her words found fertile soil. By the time Noel McKewon WB8QQC dragged us off to the airport, Kelly got *carte blanche* to help organize any youth activity for Dayton '90. As we made our rush to our respective airlines—she and Nathan on American to San Diego and Burt and me on TWA to Los Angeles—it was obvious that Kelly Howard N6PNY had some fascinating ideas on recruiting teens to amateur radio. Fade to black.

Scene 2. My den and office in Saugus. Kelly is now living in Los Angeles and getting ready to start college. This particular afternoon we are talking about Dayton weekend. It was her first and my 17th or 18th. She tells me what she wants to do at Hamvention '90. She wants to have a session where teens who are hams talk to teens who are interested in becoming hams. Where those with licenses and the ability to communicate with their peers give the hands-on experience of amateur radio to teens who know ham radio only as something that their dad or neighbor plays at as an old person's hobby. Kelly tells me young hams like herself can reach other teens and young adults. She says that it's important for her to try. So, I suggest that she tell this to the folks in Dayton and see what they say.

Scene 3. Dissolve to my living room. Sharon is watching TV. I'm reading a copy of another ham mag. A few minutes and two phone calls later, Kelly emerges from the office with the biggest smile across her face that I have ever seen. She sold her idea well enough to be asked to host the first-ever Dayton Hamvention Young People's Forum. And what will she present? Freezeframe and font over "To Be Continued."

Actually, she will be telling you that herself. I invited Kelly to be a guest writer for the next

Looking West column. In the meantime, those of you with youngsters from 9 to 19 might want to make plans to bring them with you to Hamvention '90. Kelly and her friends have a very special day planned. Who knows, after this session you may be arguing with your son or daughter over who's going get first dibs with the radio on weekends, or shelling out some extra bucks to buy your offspring an HT.

The Lights of the City

I really cannot end this month's column without a personal word of appreciation to the Dayton Amateur Radio Association and the Hamvention Committee. In April of this year they chose to honor me as the 1989 Radio Amateur of the Year. It was something that caught me completely by surprise, and it's an honor I will treasure to my dying day.

Some may view an award of this type as a measure of personal success. I look at it quite differently. To me, receiving an award—any award—means that you're making a valid contribution, and that you now have an even greater responsibility to continue and do even better so that you continue to deserve such an honor.

When I accepted the award, I asked everyone present to join me in dedicating it and the years ahead to the renewal of amateur radio—to the young and young of heart, who will pick up the banner of this great hobby and service, and carry it forth into the next century and beyond. Thanks to young, energetic and dedicated young hams like Kelly Howard N6PNY and Nathan Pyle KB6PLH, we are beginning to see a tiny bit of light at the end of a dark tunnel called apathy. There is still a long way to go.

As I close this month's *Looking West*, I ask that each of you join with me in this dedication, and that we direct our energies to bringing the youth of this nation to the hobby that we love. If we each "Elmer" into amateur radio only one new young ham, we can significantly boost our ranks—and give our nation a new base of potential engineers and technicians that it so badly needs.

Let's stop hoarding amateur radio as if it were some secret to be prized by the few and kept from the many. Let's open our doors to all who have the interest.

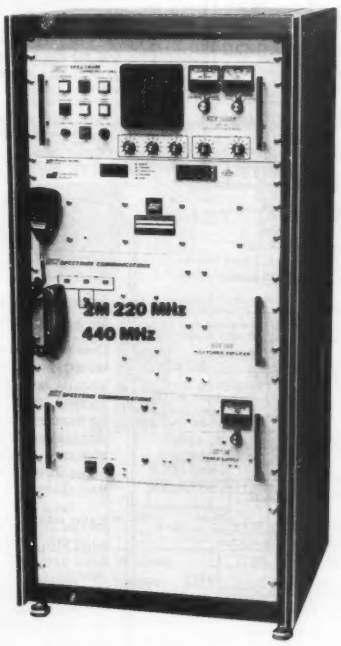
The 1990s will soon be with us and the day when Morse Code is King is dead. The new "Morse Key" is the hand-held most of us carry on our belts. The new long-wire is the rubber-ducky. The new DX is relayed by ham satellites in the sky. Some of us might even live long enough to hold a QSO through the first repeater on the moon. But only the young can make that happen, and the young will only come to amateur radio if they can bring their modern thinking with them. I for one say it's time to stop idolizing the traditions of yesterday and start building the traditions of the future. I say this because I love ham radio from the deepest reaches of my heart.

Thank you, Dayton, for making 1989 a year that will live with me into eternity. More important, thank you Dayton for recognizing that the future of amateur radio is with the young. You are doing more then your share. Let's hope other conventions and hamfests will follow your lead. It's time to tell the kids of the nation that we want them and that we care!. . .de WA6ITF

For the Latest in Repeater Technology Go with the Leader—

SPECTRUM

We've got the greatest design/performance "Know-how"—15 years in the business—with constant improvements in our Repeaters & Link Units!



SCR-1000A 2M or 220 REPEATER W/150 WT. 2M Amp & 30A POWER SUPPLY. (All items available separately)

Shown in optional cabinet.

Call or write today for details and prices! Get your order in A.S.A.P.! Sold Factory Direct or through Export Sales Reps. only.

For that new Machine—Spectrum makes 2 lines of Repeaters—the world famous Deluxe SCR1000A-VHF or SCR4000-UHF, and the basic low cost line of SCR77s.

The SCR77 Repeaters maintain the quality of design, components and construction which have made Spectrum gear famous *throughout* the world for years. However, all of the "bells & whistles" have been eliminated—*at a large cost savings to you!* The SCR77 is a real "work-horse" basic machine designed for those who want excellent, super-reliable performance year after year—*but no frills!*

Of course, if you do want a Full Featured/Super Deluxe Repeater with Full panel metering and controls, and a complete list of 'built-in' options, then you want our SCR1000A or SCR4000.

All available with Autopatch/Reverse Patch/Landline Control; TouchTone Control of various repeater functions; 'PL'; "Emergency Pwr./ID; High/Low TX Power; Tone & Timer Units; Sharp RX Filters; Power Amps, etc.

Complete Line of VHF/UHF Rcvr. & Xmtr. Link Boards & Assemblies also available. Plus ID, COR, DTMF Control BDS., Antennas, Duplexers, Cabinets, etc. Inquire.

SPECTRUM COMMUNICATIONS CORP.

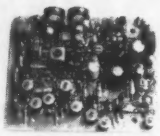
1055 W. Germantown Pk, S10 • Norristown, PA 19403 • (215) 631-1710 • TELEX: 846-211
FAX: (215) 631-5017

CIRCLE 51 ON READER SERVICE CARD

AMATEUR TELEVISION

SURVIVES 100,000 FT. FALL

KPA5 1 WATT ATV XMTR ON 434 MHZ WORKED PERFECTLY IN WB8ELK LIVE CAMERA BALLOON THROUGH 100,000 FT AND BACK TO CONTINUE RUNNING EVEN AFTER FREE FALL IMPACT IN THE MOJAVE DESERT! VIDEO SEEN FOR 300 MILES.



KPA5-E board $169

Shouldn't your ATV transmitter be as reliable? Weather you want to put one in a balloon, R/C model, Robot, use as portable ATV xmtr, or get one in our ready to go TX70-1 for the shack, with P.C. Electronics you *see* the best! Companion receiving downconverter board TVC-2G $49, or ready to go in a cabinet - TVC-4G $89.

TX70-1 XMTR $259

TVC-4G RECV CONV. $89

THE ATV TWINS

Hams, Call or Write for our latest catalog of ATV gear! Transmitters sold only toTech or higher licensed amatours varified in latest Callbook or copy of new license. 5/89

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MasterCard

P.C. ELECTRONICS
2522 Paxson Ln Arcadia CA 91006

Tom (W6ORG)
Maryann (WB6YSS)

U.S. Postal Service

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION
Required by 39 U.S.C. 3685.

1A. Title of Publication	1B. PUBLICATION NO.	2. Date of Filing
73 Amateur Radio	7 0 0 2 4 0	
3. Frequency of Issue	3A. No. of Issues Published Annually	3B. Annual Subscription Price
Monthly	12	$24.97

4. Complete Mailing Address of Known Office of Publication (*Street, City, County, State and ZIP+4 Code (Not printers)*)
Forest Road, Hancock, Hillsbornugh County, NH 03449-0278

5. Complete Mailing Address of the Headquarters of General Business Offices of the Publisher (*Not printer*)
Forest Road, Hancock, Hillsborough County, NH 03449-0278

6. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor (*This item MUST NOT be blank*)
Publisher (*Name and Complete Mailing Address*)
Wayne Green, Forest Road, Hancock, NH 03449-0278
Editor (*Name and Complete Mailing Address*)
Bryan Hastings, Forest Road, Hancock, NH 03449-0278
Managing Editor (*Name and Complete Mailing Address*)
Hope Currier, Forest Road, Hancock, NH 03449-0278

7. Owner (*If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.*)

Full Name	Complete Mailing Address
WGE Publishing	Forest Road, Hancock, NH 03449-0278

8. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities (*If there are none, so state*)

Full Name	Complete Mailing Address
none	

9. For Completion by Nonprofit Organizations Authorized To Mail at Special Rates (*DMM Section 423.12 only*)
The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (*Check one*)
(1) ☐ Has Not Changed During Preceding 12 Months (2) ☐ Has Changed During Preceding 12 Months
(*If changed, publisher must submit explanation of change with this statement.*)

10. Extent and Nature of Circulation (*See instructions on reverse side*)	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
A. Total No. Copies (*Net Press Run*)	66989	67000
B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	17135	16800
2. Mail Subscription (*Paid and/or requested*)	28105	28000
C. Total Paid and/or Requested Circulation (*Sum of 10B1 and 10B2*)	45240	44800
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies	650	670
E. Total Distribution (*Sum of C and D*)	45890	45470
F. Copies Not Distributed 1. Office use, left over, unaccounted, spoiled after printing	979	1520
2. Return from News Agents	20120	20010
G. TOTAL (*Sum of E, F1 and 2—should equal net press run shown in A*)	66989	67000

11. I certify that the statements made by me above are correct and complete. Signature and Title of Editor, Publisher, Business Manager, or Owner: Wayne Green, Publisher

PS Form 3526, Dec. 1987 (*See instructions on reverse*)

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. *Please send us your Special Event* two months in advance *of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.*

DEC 2-3

APACHE JUNCTION AZ The Superstition ARC 4th Annual Hamfest will be held at the P & M Rodeo Grounds Saturday from dawn to dusk, Sunday from dawn to noon. Talk-In: 147.12/Repeater. Contact *Bill or Marge Glaze, KA7SUF/K1YCZ (602) 832–3955.*

1st Saturday Every Month

LITTLETON CO The Denver W5YI VE Team holds exam sessions at 9 AM at the Bemis Library. Contact *Tony Marquette, (303) 773–2087 or Ken Chaffin, (303) 696–7046.*

SPECIAL EVENT STATIONS

DEC 2-3

SACRAMENTO CA The Sacramento ARC will operate Station W6AK from Sutter's Fort from 1730Z Saturday to 2330Z Sun- day to celebrate Sacramento's Sesquicentennial. Frequencies: SSB: 14.300, 21.400, 28.450 (day); 3.962, 7.270, 14.300 (night). CW: 14.050. For QSL send SASE to *Sacramenio ARC, P.O. Box 161903, Sacramento CA 95816.*

EVERGLADES NATIONAL PARK FL Station W4SVI will be operated at the Flamingo Camp Grounds by the Everglades ARC, from 1400 UTC Saturday until 1900 UTC Sunday, to celebrate the 42nd Anniversary of Everglades National Park. Frequencies: Phone: 7.230, 14.240, 21.330, 28.375; CW: 7.030, 14.030, 21.130. Send QSL and 2 units of postage for an unfolded certificate to *Everglades ARC, P.O. Box 113, Homestead FL 33090-0113.*

DEC 26-31

SAN BENITO TX The San Benito ARC will operate Station WA2VJL to celebrate the well deserved "R & R" of Santa and Rudolph in the Lower Rio Grande Valley of South Texas. Let the little ones wish Santa a safe trip home. Exchange local weather info and anything else. Frequencies: SSB 21.350 and 28.325. Time of operation will depend on band conditions, with (weekday) 1500–0200, and all day weekends. For certificate send 9 ½ x 11 with QSL to *Santa Claus, c/o San Benito ARC, P.O.Box 1382, San Benito TX 78586-1382.*

DEC 30–JAN 1

PASADENA CA The Relay Repeater ARC will operate KE6PE from the Wrigley Mansion to commemorate the 101th Anniversary of the Tournament of Roses. The station will operate from 1600Z–0400Z each day. Frequencies: 14.260, 21.335 and 28.450 Novice/ Tech frequencies and/or QRM. For Certificate send QSL and 9 x 12 SASE to *Relay Repeater Club, P.O. Box 81, Arcadia CA 91006-5019*

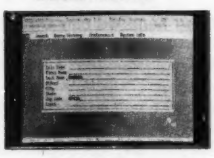
Number 19 on your Feedback card

500,000 Radio Amateur Call Signs at Your Fingertips

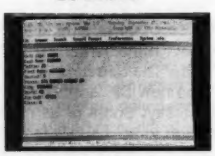
Introducing Buckmaster's HamCall on CD-ROM

Over 500,000 call signs in the U.S. and possessions are available, searchable by call sign, name, address, city, state, Zip code or license class. Using CD-ROM optical disc technology and your micro-computer, you have instantaneous access to the Buckmaster HamCall data base.

From Here



To Here



$499.95 per Package plus Shipping (Quantities Limited)

HamCall on CD-ROM is a package that includes the CD-ROM data disc, a Sony CDU-6100 external CD-ROM drive with interface card for IBM PC/AT type computers,* and MS-DOS CD-ROM extensions software.

Instantly!

Publishers Data Service Corporation's new Questar™ retrieval software package is also supplied. This retrieval system enables the user to search the CD-ROM data quickly and efficiently.

Order by calling 1-800: 282-5628

SONY.

BUCKMASTER
"Whitehall" Rte. 3, Box 56
Mineral, Virginia 23117
703: 894-5777

*Requires 640k RAM, hard disk drive and MS-DOS 3.1 or later version.

INTERNATIONAL
RADIO AND COMPUTER, INC.
ANNOUNCES

We now have in stock
HIGH PERFORMANCE
8-POLE CRYSTAL FILTERS

AVAILABLE
FOR MOST
KENWOOD/ICOM/
YAESU PRODUCTS

Call or write today for our **FREE** Crystal Filter Catalog that explains why our filters are the best.
It also contains information on our Kenwood, Icom, and Yaesu monthly newsletters, high performance radios, Tuning Upgraders, and Bank Controllers.

★ **REMEMBER** ★

•We guarantee the reliability of everything we sell with a complete performance and function check.
•We offer complete and efficient service on everything we sell with quality Factory Service parts.
•We have been servicing the amateur radio community for eight years and have 1000's of satisfied customers across the country.

Call us for a quote before you make your next equipment purchase.

(407) 879–6868
FAX (407) 878-8866
INTERNATIONAL
RADIO AND COMPUTERS, INC.
751 South Macedo Blvd.
Port St. Lucie, FL 34983

VISA MasterCard

COMPUTERIZE YOUR SHACK

Control up to eight digital radios simultaneously from your MS-DOS microcomputer! DataCom, Inc. offers a series of software/hardware packages that interface with many current synthesized rigs. These include:

ICOM 735, IC-761, IC-781, IC-R7000, IC-R71A
Yaesu 747, 757GX, 757GXII, 767, 9600
Kenwood TS-440, TS-940, TS-140, TS-680, 711, 811, R5000

Datacom couldn't be simpler to install. The user doesn't need to know anything about MS-DOS—the installation program does it all! After installation, the user sets the parameters with menus.

These packages allow complete control of these rigs from the keyboard, and more! Datacom adds:

- ***Scan functions added to radios that don't allow this from the front panel.**
- ***Frequency and associated info memory limited only by disk storage.**
- ***Tabular screen display of all of the channels stored in memory, along with a full description of each, including:**
  - **—mode (LSB, USB, FM, etc.)**
  - **—eight character alphanumeric description**
  - **—signal bandwidth**
- ***continuously variable scan delay from 100 milliseconds up**
- ***a full-featured logging utility**

AVAILABLE FOR IBM PC, XT, AT, 80386 256K RAM
1 SERIAL PORT AND 1 FLOPPY MINIMUM

PROGRAM WITH INITIAL LIBRARIES	**99.95**
RS-232 TO TTL INTERFACE ONLY (NEEDED IF DON'T HAVE MANUFACTURERS INTERFACE)	
EXTERNAL INTERFACE ALLOWS 4 RADIOS	**99.95**
INTERNAL PC INTERFACE W/1 SERIAL & 1 RADIO PORT	**129.95**
SPECTRUM ANALYZER MODULE	(CALL FOR PRICE)
COMPLETE SYSTEMS INCL. RADIO, INTERFACE, COMPUTER, AVAILABLE	(CALL FOR PRICE)

DATACOM, INT.
BOX 5205
HOLLYWOOD, FL 33083
(305) 987–9505 FAX (305) 987–4026

CIRCLE 147 ON READER SERVICE CARD

ASSOCIATED RADIO
8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

CALL 913-381-5900
FAX 913-648-3020

BUY—SELL—TRADE
All brands new and reconditioned.

EVERY DAY A HAMFEST
WE'LL BUY YOUR EXTRA RIG STATIONS - ESTATES ETC.

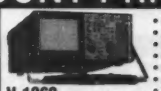
Send $3.00 for our current catalog and wholesale sheet.

HITACHI SCOPES AT DISCOUNT PRICES

V-212 $425
List $595
Save $170

20MHz Dual Trace Oscilloscope
All Hitachi scopes include probes, schematics and Hitachi's 3 year guaranty on parts and labor. Many accessories available for all scopes.

V-425 $849
List $1,070
- DC to 40MHz
- Dual Channel
- CRT Readout
- Cursor Meas
- DC Offset
- Alt Magnifier
- Compact Size

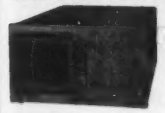


V-1060 $1,359
List $1595
- DC to 100MHz
- Dual Channel
- Delayed Sweep
- CRT Readout
- Sweep Time
- Autoranging
- Trigger Lock
- 2mV Sensitivity

			LIST	PRICE	SAVE
V-223	20MHz	D.T., 1mV sens, Delayed Sweep, DC Offset, Vert Mode Trigger	$825	$725	$100
V-422	40MHz	D.T., 1mV sens, DC Offset Vert Mode Trigger, Alt Mag	$940	$740	$200
V-423	40MHz	D.T., 1mV sens, Delayed Sweep, DC Offset, Alt Mag	$1,025	$825	$200
V-660	60MHz	D.T., 2mV sens, Delayed Sweep, CRT Readout	$1,295	$1,145	$150
V-1065	100MHz	D.T., 2mV sens, Delayed Sweep, CRT Readout, Cursor Meas	$1,895	$1,670	$225
V-1100A	100MHz	D.T., 1mV sens, Delayed Sweep, CRT Readout, DVM, Counter	$2,450	$2,095	$355
V-1150	150MHz	D.T., 1mV sens, Delayed Sweep, Cursor Meas, DVM, Counter	$3,100	$2,565	$535

ELENCO PRODUCTS AT DISCOUNT PRICES

20MHz Dual Trace Oscilloscope



$375
MO-1251
- 6" CRT
- Built in component tester
- TV Sync

FREE DMM
with purchase of MO-1251 1252 Scope

SCOPE PROBES
P-1 65MHz,1x,10x **$19.95**
P-2 100MHz,1x,10x **$23.95**

35MHz Dual Trace Oscilloscope

$495
MO-1252
- High luminance 6" CRT
- 1mV Sensitivity
- 6KV Acceleration Voltage
- 10ns Rise Time
- X-Y Operation • Z Axis
- Delayed Triggering Sweep

Top quality scopes at a very reasonable price. Contains all desired features. Two 1x, 10x probes, diagrams and manual. Two year guarantee.

PRICE BREAKTHRU on Auto Ranging DMMs

3 to choose from:
MDM-1180 $24.95
MDM-1181 $27.95
MDM-1182 $29.95
- 3 1/2 LCD Display
- 27 Functions
- Auto /Manual Ranges
- Audible Continuity
- Data Hold (MDM-1182)
- .1% Accuracy (MDM-1181)

True RMS 4½ Digit Multimeter
M-7000 $135
.05% DC Accuracy
.1% Resistance
with Freq. Counter and deluxe case

Multimeter with Capacitance and Transistor Tester
CM-1500A $55
Reads Volts, Ohms, Current, Capacitors, Transistors and Diodes with ease

Digital Capacitance Meter
CM-1550 $58.95
9 Ranges
.1pf-20,000ufd
.5% basic accy
Zero control with case

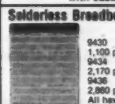
Digital LCR Meter
LC-1800 $125
Measures Coils 1uH-200H Cacs. 1pf-200uf Res .01-20M

Bench DMMS

M-3500 $125 3½ digit .1% accy
M-4500 $175 4½ digit .05% accy

SOLDERING STATION
Temperature Controlled
SL-30 **$99**
Digital display
Temp range 300F-900F
Grounded tip
Overheat protect

Solderless Breadboards



9430 1,100 pins $15
9434 2,170 pins $25
9436 2,860 pins $35
All have color coded posts
9436 SHOWN

AC Clamp-On Current Adapter

ST-265 $25
0-1000A AC
Works with most DMM

Wide Band Signal Generators

SG-9000 $129
RF Freq 100K-450MHz
AM Modulation of 1KHz
Variable RF output
SG-9500 with Digital Display and 150MHz built-in Freq Ctr $249

3½ Digit Probe Type DMM

M-1900 $39
Convenient one hand operation with batteries and case
Measures DCV, ACV, Ohms
Audible continuity check, Data hold

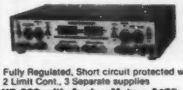
Function Generator Blox #9600 $28.95

Provides sine,tri,sqa wave from 1Hz to 1MHz
AM or FM capability

Decade Blox #9610 or #9620 $18.95

#9610 Resistor Blox
47 ohm to 1M & 100K pot
#9620 Capacitor Blox
47pf to 10MFD

Digital Triple Power Supply XP-785 $249



0-20V at 1A
0-20V at 1A
5V at 5A
Fully Regulated, Short circuit protected with 2 Limit Cont., 3 Separate supplies
XP-860 with Analog Meters $175

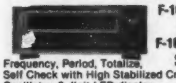
Quad Power Supply XP-580 $59.95

2-20V at 2A
12V at 1A
5V at 3A
-5V at 5A
Fully regulated and short circuit protected
XP-575 without meters $39.95

10Mhz XT 100% IBM® Compatible
MODEL PC-1000 $595
5 Year Warranty

5/10MHz Motherboard
8 Expansion Slots
Math Compressor Slots
360K Floppy Drive
AT Style Keyboard
150W Power Supply
256K RAM
Expandable to 640K
Monochrome Monitor
Monographic Video Card
Parallel Printer Port
FREE spreadsheet and word processor
3.XXMS DOS and GW Basic add 75.00

Four-Function Frequency Counters



F-100 120MH $179
F-1800 1.2GH $259
Frequency, Period, Totalize, Self Check with High Stabilized Crystal Oven Oscillator, 8 digit LED display

GF-8016 Function Generator with Freq. Counter

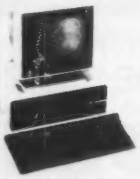
$249
Sine, Square, Triangle
Pulse, Ramp, .2 to 2MHz
Freq Counter .1 - 10MHz
GF-8015 without Freq. Meter $179

WE WILL NOT BE UNDERSOLD!
UPS Shipping: 48 States $5 ($10 Max) IL Res. 7% Tax

C & S SALES INC.
1245 Rosewood, Deerfield, IL 60015
(800) 292-7711 (312) 541-0710

15 Day Money Back Guarantee
2-Year Warranty
WRITE FOR FREE CAT ALOG.

CIRCLE 356 ON READER SERVICE CARD



FREE
IBM - PC
SOFTWARE CATALOG

- For Hams, Electrical Engineers and Finicky PC Users.
- Hundreds of programs tested to IDS's rigid standards.
- IDS's president is a HAM and hard to please. Only 30% of the programs submitted for testing make it to the catalog.
- He's also a Cheapskate!

Programs Include:
CW CODE PRACTICE • CONTEST LOG • *accurate* BEAM HEADINGS • GRAPHIC on-screen-*plotting* CALCULATORS • CIRCUIT DESIGN AIDS • *super-tested* PROPAGATION FORECASTING • TERMINAL EMULATION

NONE OF OUR DISKS COST OVER $4.95

Please send your Name and Address (we would be grateful for $.65 cash or stamps for postage, but not required) to:

INTERCON Data Systems
Dept. 7, P.O. Box 696
Gambrills, MD 21054-0696

UAI-10 AND UAI-20
UNIVERSAL REPEATER/LINK
AUDIO INTERFACE

Detailed application manual
Low power operation, 19ma @ 12v
CTCSS decoder on the UAI-20 only
Assembled, tested, one year warranty
Link monitor-mix/monitor mute control
Adjustable repeater/link/DTMF audio outputs
Selectable DTMF mute on repeater and link audio
Repeater, link, auxiliary and control audio inputs

UAI-10 **$44.00** UAI-20 **$89.00**

CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405

CIRCLE 306 ON READER SERVICE CARD

SPECIALISTS IN FAST TURN P.C. BOARDS

PROTO TYPE P.C. BOARDS
AS LOW AS $25.00

- SINGLE & DOUBLE SIDED
- PLATE THROUGH HOLES
- TEFLON AVAILABLE
- P.C. DESIGN SERVICES

FOR MORE INFORMATION

Midland Technologies

34374 EAST FRONTAGE ROAD
BOZEMAN, MT 59715 (406) 586-1190

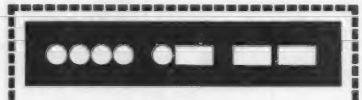
CIRCLE 252 ON READER SERVICE CARD

HUGE SHORTWAVE CATALOG

- Communications Receivers
  Japan Radio, Kenwood, Icom and Yaesu.
- Portable Receivers
  Grundig, Sangean, Magnavox, Sony and Panasonic.
- Antennas & Headphones
- Tuners, Preamps and Filters
- VHF-UHF Receivers
- Radioteletype Equipment
- Facsimile Equipment
- Books & Accessories

Send $1 to

Universal Radio
1280 Aida Drive Dept. 73
Reynoldsburg, OH 43068



Factory Authorized Dealer & Service For
KENWOOD
YAESU
ICOM

Call Us For Great Prices & Great Service

TOLL FREE ORDER LINE 1-800-344-3144
Continental U.S. & Texas

BEDFORD, INC. THE HAM CENTER SAN ANTONIO TEXAS
SALES AMATEUR RADIO SERVICE
5707A Mobud San Antonio, Texas 78238 (512) 680-6110
FAX (512) 647-8007

Factory-less, jumper-less, ROM-less programming.

With the new **S-COM 5K** Repeater Controller, you'll be able to configure your repeater remotely—using DTMF commands. Only the 5K offers this capability for just $195, wired and tested.

S-COM Industries
P.O. Box 1718
Loveland, CO 80539
(303) 663-6000

CIRCLE 93 ON READER SERVICE CARD

Number 21 on your Feedback card

UPDATES

DXDA Country List/ October 1989

A group of countries were accidentally dropped from the list before it went to press. They are: Chad (TT), Chagos (VQ9), Chatham Island (ZL), Chesterfield Island (FK8), Chile (CE), China (BY), Christmas Island (VK9X), Clipperton Island (FO0), Cocos Island (TI9), Cocos/Keeling Island (VK9Y), Colombia (HK), Comino Island (9H), Comores (D6), Congo (TN), Cook Island (ZK1), Corsica (TK), Costa Rica (TI), Crete (SV9), and Cuba (CO). *73* regrets any inconvenience this may have caused anyone.

Kaboom Micro Keyer/ September 1989

John Curtis of Curtis Electro Devices sent us his suggestions for enhancing the Kaboom Micro Keyer. Connect pin 12 of the 8044 either to pin 16 or to pin 1 for termination. This "unfloats" the CMOS input, reducing battery drain and the chance of it going into oscillation. John also suggests using a single transistor for the output, and, if necessary, lowering the value of the drive resistor (e.g., from 4.7kΩ to 1kΩ) to give increased drive.

For previous changes to the original Micro Keyer article, see "Updates" in the October issue of *73*.

SAVE TIME & POSTAGE!

Circle advertiser's numbers on our handy reader service card to send for valuable information from advertisers in this issue. Use our Ad Index to locate advertiser's Reader Service numbers even faster!

SUMMITEK
P.O. Box 520011 Salt Lake City, UT 84152
24 Hour order/info (801) 277-4205

Want about 10 times the power from your 2 M handheld as you get with a halfwave antenna? The backpackable DL-146 PORTA-BEAM gives you this and more.
Summitek offers:

PORTA-BEAM

- DL 146 is a 3-element handheld delta loop antenna for 2 meters.
- Weighs only 19 ounces.
- Assembles easily in the field with no small parts to lose.
- All elements and connecting BNC tipped cable store in the DL-146 boom.
- Virtually indestructable in stored condition.
- Ideal for ARES, RACES, and mountain topping.
- Optional 6 foot mast and 12 foot coax cable available for field day or emergency use.

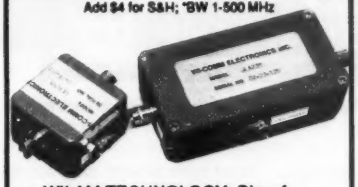
DL-146 PORTA-BEAM $79.95
PORTA-MAST $14.95
12' male/female BNC cable ... $11.95
(US/CAN shipping included)

Write or call our 24 hour message service for more information or to place an order.
Money back if not fully satisfied.

5-1000 MHz PREAMPLIFIERS

	NF	G	P(1 dB)	$
WLA20M*	2dB	15dB	0dBm	73
WLA21M	3	13	8	57
WLA22M	4	11	12	61
WLA23M	4	22	12	87
WLA24M	3	23	18	109
WLA25M	5	11	20	82
WLA26M	6	21	24	199

Add $4 for S&H; *BW 1-500 MHz



WILAM TECHNOLOGY, Div. of

WI-COMM ELECTRONICS INC.
P.O. Box 5174, MASSENA, N.Y. 13662
(315) 769-8334

INDUSTRIAL PRINTER SALE
VICTOR 5080

IDEAL FOR INVOICING, BUSINESS FORMS, PACKET RADIO, TELETYPE, OR ANY HEAVY PRINTING APPLICATION. WHY USE A GOOD LETTER QUALITY DOT MATRIX OR DAISY WHEEL FOR PRINTING INVOICES AND FORMS, MONITORING PACKET & RTTY WHEN A HEAVY DUTY DOT MATRIX PRINTER IS ALL THAT IS NECESSARY?

- MADE FOR CONTINUOUS DUTY
- 4 INTERFACES STANDARD: PARALLEL, RS-232, TTY, IEEE-488
- BI-DIRECTIONAL

- 80 COLUMN—100 CPS
- FANFOLD OR ROLL PAPER
- RE-INKABLE RIBBON
- HANDLES 6 PART FORMS
- COMMERCIALLY SOLD AT $1195.00

NEW & FACTORY SEALED **$100.00**
FOR MORE INFORMATION, OR TO ORDER, PLEASE CALL:

HORIZON MANUFACTURING
1500 MIDWAY COURT W1A
ELK GROVE, IL 60007
PHONE: 312-439-6800 FAX: 312-439-3799

LIMITED QUANTITY

ALL ORDERS SHIPPED BY UPS
IL AND TX RESIDENTS INCLUDE APPLICABLE SALES TAX

CIRCLE 110 ON READER SERVICE CARD

Discover
CAROLINA WINDOM

80-10M
Use transmatch
132' overall
Matching section
Line isolator
Vert Radiator
Coax fed
Assembled
$69.95

High performance
Proven Results
$70 Beam?

The RADIO WORKS

Rugged new baluns
Full range of HF, VHF mobile antennas, ducks, wire, coax, parts, line, accessories

SEE WHAT WE'RE DOING NOW!
Contact Jim, W4THU—free discount catalog
Send $1 for catalog by 1st Class mail
Box 6159, Portsmouth, VA 23703
(Dealer Inquiries Welcome)

804-484-0140

CAROLINA WINDOM
SEE THE REVIEW IN DECEMBER 88 73 MAGAZINE

Enthusiastic users say it's the best wire antenna. Outperforms wire antennas previously used. Knock-your-socks-off performance on 80-10. A 3/70 beam."

If you hear one, you'll want one.
Made with pride by the RADIO WORKS in VA USA

CIRCLE 150 ON READER SERVICE CARD

YOU'RE COVERED

We carry a full line of **COVER CRAFT** anti-static dust covers, **STAT-PRUF** computer static control mats, **REGATTA** washable cloth dust covers and **FIELD-PRO** computer cases. Don't put off the protection of your equipment until it's too late!

We also carry Universal Electronics, COAX-SEAL and Amateur Radio Books

Prices starting at $8.95

For more information on our competitive pricing and selection, send $1.00 to:

VISA MasterCard

Gauthier's Covers Plus
PO. Box 495, Prescott, AZ 86302
(602) 776-9711

* Cover Craft is guaranteed for the life of your equipment

CIRCLE 46 ON READER SERVICE CARD

RAISED PRINT QSL CARDS

From Dennis, WA5QMM

Offset Printed - High Quality
Nothing like it anywhere! You can actually FEEL the type! 17 beautiful designs including a Full-Color Eagle.
For Free samples & Info. call
(318) 443-7261

Network QSL's - P.O.B. 13200 - Alexandria, LA 71315-3200

CIRCLE 44 ON READER SERVICE CARD

NEW HI-PASS TVI FILTERS:

100% Guaranteed. Use linear anytime with no trace of TVI.
(Not one refund ever requested.)

Not for use with 300 ohm twinlead.
$22.95 for Model BX
$17.95 for Model CX (for the neighbors)
Also . . . Effective phone filters—$16.95

TCE LABS
5818 Sun Ridge, San Antonio, TX 78247
(512) 656-3635 or Order Toll Free
1-800-KILL TVI
Texas Residents add 8% TAX

CIRCLE 87 ON READER SERVICE CARD

80 1SCAN

801-SCAN can turn your ICOM R7000 and PC into the ULTIMATE SCANNING SYSTEM!

- Define 1800 channels in 200 banks per database
- Use screen windows to quickly select banks to scan
- Define up to 100 search ranges
- Choose from 3 scan-continue delay modes
- Set scan-continue timer from 0.0 to 999.9 seconds
- Search with activity log to find new activity
- Generate %-active reports for channels or banks
- Your channel and bank text description (22 characters) displayed as you scan. Know what you're listening to!
- Increase your scan speed to 15 channels per second
- Function keys to instantly start/stop/continue/search, lock-out a channel, set frequency to + or − offset, select delay time, select scan-continue mode, more!
- Program your R7000 memories from your PC in seconds

Program runs on IBM-compatible PC with 512K+ memory. Complete system includes internal (half-slot card) or external (use your RS-232) PC interface and cabel . . $98
Demonstration program (R7000 not required!) $6
Check or M.O., TX residents add 8% sales tax.
Write for more information.

801-SCAN
397 Dal-Rich Village Suite 212
Richardson, TX 75080

CIRCLE 22 ON READER SERVICE CARD

Wideband Preamp 10-1000 Mhz

Dual GasFet low noise preamplifier for HF, UHF or VHF systems. Just perfect for the R-7000. Excellent for Spec Analyzers, Scanners, etc. Gain 20 Db +/- 1 DB, -3 Db at 2 & 1100 Mhz. 1 Db compression of >+10 Dbm. Intercept points >+45 Dbm. New shipped price of only $124.95. Pa. residents please add 6% state tax.

GTI Electronics
RD 1 BOX 272
Lehighton, Pa. 18235
717-386-4032

CIRCLE 326 ON READER SERVICE CARD

THE RF CONNECTION

"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
PL-259/USA	UHF Male Phenolic, USA made	$ .70
83-1SP-1050	PL-259 Phenolic, Amphenol	.89
83-822	PL-259 Teflon, Amphenol	1.75
PL-259/ST	UHF Male Silver Teflon, USA	1.50
UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21D/U	N Male RG-8, 213, 214, Delta	3.25
UG-21B/U	N Male RG-8, 213, 214, Kings	5.00
9913/PIN	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	5.75
UG-146A/U	N Male to SO-239, Teflon USA	6.00
UG-83B/U	N Female to PL-259, Teflon USA	6.00

"THIS LIST REPRESENTS ONLY A FRACTION OF OUR HUGE INVENTORY"

THE R.F. CONNECTION
213 North Frederick Ave. #11
Gaithersburg, MD 20877
(301) 840-5477

PRICES DO NOT INCLUDE SHIPPING
PRICES SUBJECT TO CHANGE
VISA, MASTERCARD, ADD 4%
UPS C.O.D. ADD $3.00 PER ORDER

CIRCLE 115 ON READER SERVICE CARD

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
San Diego CA 92119

Ed Barbacow K3ZCY (FM09AV) advertises his passion in ham radio on his license plate.

PLL Brick Oscillators

Not wishing to re-invent the wheel (and being lazy), I would like to introduce you to the "Brick," a phase locked local oscillator packaged in a small metal block housing about half the size of a small paving brick.

This surplus high-stability microwave oscillator is the same type used for narrowband FM and SSB contacts on 3, 5, and 10 GHz. For a 10 GHz preamplifier, see the August 1989 issue of *73*. This receiving low-noise amp with 18 dB gain also doubles as a transmitting amplifier with about +8 dBm output. This preamp and brick oscillator combination make a very simple microwave transceiving converter.

A simple, stable local oscillator (LO) is the key to operating on your chosen band. Even in some of the better kits for our microwave bands, the LOs lack stability and purity, both crucial items. You can build mixers and amps from surplus devices.

All the oscillators I've obtained over the years have been surplus items costing $20–50 each, depending on condition. Recently, I picked up some bricks from Alan Dickerson N5BXH, who obtained them from Collins Microwave sales in Richardson, Texas. Many years ago, I attended a microwave school at the same Collins plant, and spent my time off in their salvage store picking up my first brick. I had been using them commercially, but this was the first one I could experiment on, as they were very expensive then at $1700 each.

Brick oscillators are popular because they're compact and easy to use. In a microwave station, they eliminate the need for any other oscillator multiplier chain or signal source from microwave to your basic IF conversion frequencies. With a brick oscillator and its respective internal crystal, and a mixer, you have the basic setup for transceiving on either narrowband FM or SSB; on 10 GHz, or other microwave frequency.

> ***"A simple, stable local oscillator (LO) is the key to operating on your chosen (microwave) band."***

Inside the Brick

Though there are many brick manufacturers, California Microwave and Frequency West (both in the San Franscisco area) are the most popular. All brick oscillators have a high power microwave oscillator in the 1.2–1.4 or 1.7–2.0 GHz range. Power output is about 1 watt. Two, three, or four transistors in parallel form the oscillator circuit for different power output levels. Sometimes companies junk these devices when one of the transistors goes open, lowering output power. Though it's unsuitable for commercial use, it's still fine for amateur use.

The high power oscillator is multiplied to the higher microwave band by a very efficient step-recovery diode (high priced varactor), producing many high order harmonics. In the case of the 1.7 GHz oscillator, the sixth harmonic is bandpass filtered (low loss), and provides high loss to the other, unwanted harmonics. This filter has an easy job, as the harmonics are widely spaced (1.7 GHz). Power output from the filter is about +10 to +20 dBm with +10 dBm being normal on the surplus (bad) units I've obtained.

The neat trick of these oscillators is that they maintain frequency at 10 GHz to about 200 Hz for short term (several day) stability. Frequency drift over a week of operation would yield errors at 10 GHz of 5 to 10 kHz. With better temperature stability applied to the 100 MHz crystal, errors have been reduced to 2.4 kHz per week. The surplus cost of the brick, modest compared to a crystal oscillator and its multiplier string, makes the brick more than worth it. Thus, this makes them ideal for narrowband operations, or operations that require high stability, such as packet and other data transmissions and SSB.

How the Brick Works

It's quite simple. The brick operates from a −19 volts. An internal crystal reference oscillator operates in the 96 to 108 MHz range, depending on microwave output frequency. The crystal oscillator is buffered and amplified in a power amplifier to about ½ watt.

The power amplifier stage drives a varactor to produce a signal rich in harmonics to the signal mixer. The high power microwave oscillator is also injected into another port of the signal mixer. The sum/difference product from the signal mixer is applied to a video amplifier whose output controls a varactor in the high power microwave oscillator cavity. See Figure 1 for a block diagram of the brick oscillator.

The sum/difference product applied to the video amplifier changes its DC output higher or lower, biasing the varactor to try to lock up the microwave oscillator to a harmonic of the crystal reference. The circuitry of the brick oscillator is such that, if lock is lost, there is a sweep circuit that will cause the microwave oscillator to vary in frequency (slow fixed-rate sweep) in an attempt to regain lock.

However, if the circuit is so far out of lock, you have to restore (lock) range with a mechanical

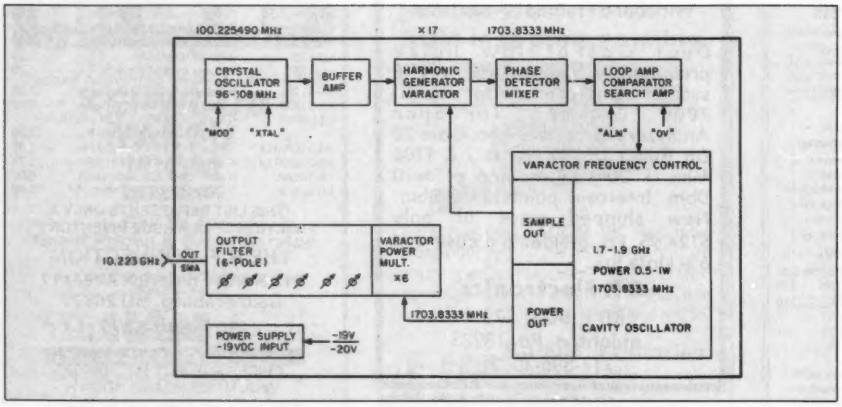


Figure 1. Block diagram for your basic microwave brick oscillator.

EVERY ISSUE of *73* on microfiche!

The entire run of *73* from October, 1960 through last year is available.

You can have access to the treasures of *73* without several hundred pounds of bulky back issues. Our 24x fiche have 98 pages each and will fit in a card file on your desk.

We offer a battery operated hand held viewer for $75, and a desk model for $200. Libraries have these readers.

The collection of over 600 microfiche, is available as an entire set, (no partial sets) for $225 plus $5 for shipping (USA). Annual updates available for $10.

Your full satisfaction is guaranteed or your money back. Visa/MC accepted.

BUCKMASTER PUBLISHING
"Whitehall"
Route 3, Route 56
Mineral, Virginia 23117

703-894-5777
800-282-5628

CIRCLE 365 ON READER SERVICE CARD

AMATEUR RADIO AND COMPUTER EQUIPMENT

CompuTel Inc. 800-942-8873

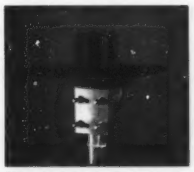
ICOM KENWOOD YAESU AEA
ASTRON MFJ concept
cushcraft CORPORATION HUSTLER
AND MUCH MORE.

Call for your $pecial Price

1057 East 2100 South
Salt Lake City, UT 84106
801-467-8873

CIRCLE 343 ON READER SERVICE CARD

108-1000 MHZ RADIO DIRECTION FINDING



★ Interference Location
★ Stuck Microphones
★ Cable TV Leaks
★ ELT Search & Rescue

New Technology (patented) converts any VHF or UHF FM receiver into a sensitive Doppler shift radio direction finder. Simply plug into receiver's antenna and external speaker jacks. Models available with computer interface, synthesized speech, fixed site or mobile - 108 MHz to 1 GHz. Call or write for details.

DOPPLER SYSTEMS, INC. P.O. Box 31819 Phoenix, AZ 85046 (602) 488-9755 FAX (602) 488-1295

CIRCLE 13 ON READER SERVICE CARD

Receive High Quality GOES Satellite Images

Now you can receive high quality weather satellite images on your IBM style computer. For a "**Free Demo**" Disk, WRITE OR CALL TODAY!

Computers, Inc.
1017 Riverview Drive
Kalamazoo, MI 49001
616-388-6030

GOES 1691 MHz RECEPTION

S-BAND CONVERTER FOR YOUR 137 MHz RECEIVER

1691-LY (N) → PREAMP MMg1691 → CONVERTER MMk 1691-137.5 → RECEIVER 137.5 MHz

1691-LY (N)	MMg 1691	MMk 1691-137.5
GAIN: 20dB	GAIN: 13dB	GAIN: 30dB TYPICAL
BOOM: 6'	N.F.: 1.2dB	N.F.: 6.8dB MAXIMUM
$91.50	12VDC @ 40 ma	12VDC @ 150 ma
	$250.00	$330.00

Send 75¢ (3 stamps) for detailed specs on all VHF & UHF products. Shipping FOB Concord, MA
PRICES SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

si SPECTRUM INTERNATIONAL INC. (508) 263-2145
P.O. Box 1084S, Concord, MA 01742, USA

CIRCLE 183 ON READER SERVICE CARD

Short Broadband Dipoles & Slopers

Trapless 3-conductor legs create short antenna with broad 2- & 3-band resonance.

FB Dipoles
FB 80/40/15 62' (•CW•Center •LSSB•HSSB) $79.95
FB 40/20 31' $69.95
FB 20/10 16' $59.95
When ordering add $3 P&H
Infopack $1

Trapless 2 & 3 band Tower-Mount FB HalfSlopers
FB 160/80/30 CW 70'
FB 160/75 SSB 62' $69.95
•2KW •Efficient •Coax Fed •Ready to Use •No Caps or Coils •Fully wx sealed & insulated

AntennasWest
Box 50062-S, Provo, UT 84605 (801) 373-8425

CIRCLE 303 ON READER SERVICE CARD

VISA ICOM MasterCard

VHF COMMUNICATIONS

9:00 am - 5:30 pm weekdays
Weekends and evenings by appointment.

AURORA ELECTRONICS

280 Tiffany Avenue
Jamestown, New York 14701

Western New York's finest... amateur radio dealer!
PH. (716)664-6345

adjustment. Normally, the microwave oscillator will lock over a 10 to 20 MHz range. All this house cleaning is taken care of with internal circuitry, as the brick is completely self-contained. Lock indication is verified by the "0V" or phase terminal on the brick. When not in lock, the brick will be fixed at −9.5 volts.

When the brick is in lock, adjust the microwave cavity while watching the "0V" or phase terminal with a voltmeter; it will vary from about −2 to about −13 volts. The brick is mechanically set to −7.5 volts, the center of its lock-in range.

You can verify that the crystal oscillator is functioning properly by metering the crystal terminal. You'll read about 1–2 volts, depending on crystal activity and circuit adjustment. Built for the telephone companies where power is positive ground, these units require a −19 volts at 500 mA, with slightly higher current until the crystal oven throttles back. Some of the oscillators are marked for −20 volts, and the difference is that these units have an internal rectifier diode protecting the oscillator from accidental reverse polarity. It also drops the input voltage 0.7 volts, making both oscillators otherwise identical.

Crystals for the bricks are specially ordered for each type, as they are cut to a very close tolerance. For a Frequency West brick, type MS-54XOL (10 GHz) is needed for 10.223 GHz. Specify part #585132 from International Crystal. If your brick is different, and you're unable to locate the exact type of crystal, give them all the information on your oscillator type. Cost per crystal runs about $15.

Modifications for the Brick

With simple modifications, you can outfit brick oscillators with connectors on the high power oscillator, tapping part of the power for uses still locked in the 1.2 or 1.7 GHz range, depending on which type of brick you have. Also, you can use this connector for injection to a different varactor multiplier filter for other frequency combinations.

These bricks don't operate on our bands, so you need to adjust them. First, adjust the output filter to pass the next lower frequency harmonic. This retunes them from 11 GHz to the lower 10 GHz range. In my Frequency West brick model MS-740MXOL-37, a crystal at 100.225490 MHz is mixed (the seventeenth harmonic) with the microwave oscillator (locked) at 1703.8333 MHz. The 1703.8333 MHz oscillator (high power) is multiplied (times six) to our 10 GHz frequency, or 10.223 GHz. This is mixed with a 2 meter IF 145 MHz, and then you have 10.368 FM or SSB, depending on the IF unit capability.

The most common surplus bricks I've obtained are in the 10, 6, 3, and 2 GHz ranges. The oscillator scheme is similar in all other models. Once you obtain an oscillator and mixer combination for any of our microwave bands, you're almost ready to place a microwatt transceiver in operation. With such a setup (no preamp), power output is just less than 1 milliwatt. This has worked paths over 100 miles. How about that for QRP? Couple this with relay switching and preamps, and you have an excellent station operating SSB or 5 kHz deviation FM.

"All the (microwave) oscillators I've obtained over the years have been surplus items costing $20–50 each, depending on condition."

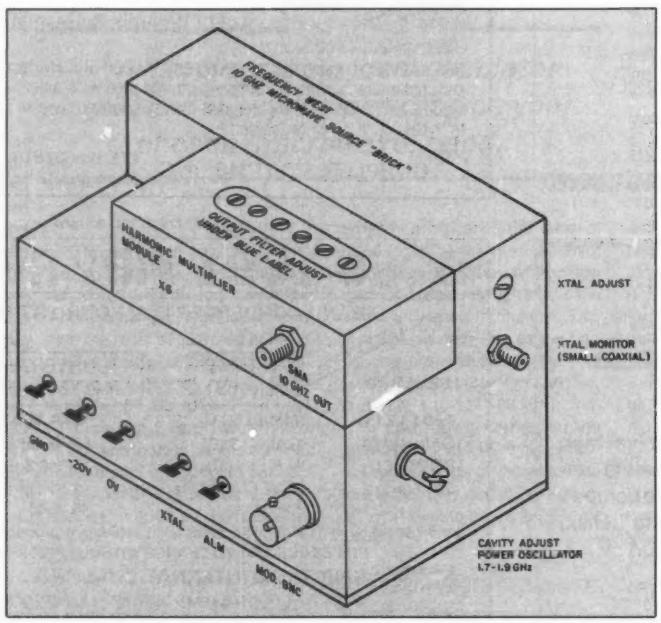


Figure 2. Frequency West 10 GHz microwave source "brick."

Mailbox

That's it on the brick this month; I'll soon cover mixers and their use. Now, for the Mailbox. Curt Law WA2PIV/KL7 reports installation of a new 10 GHz beacon operating from Kodiak Island on the northern edge of the Heitman Ridge. The beacon operates on 10.260 GHz, 10 mW, 75 feet up a tower. The antenna is a 17 dB horn pointed towards Washington State. The beacon will be on the air until the access road to the microwave site freezes. Contact Curt for info at PO Box 1538, USCG, Kodiak AK 99619.

Ed K3ZCY reports having an 11 GHz surplus transceiver and wants to know how to turn it into a 10 GHz transceiver. The unit uses WR-75 (WG-17), the next size smaller guide than the normal WR-90 (WG-16). Not to fret. Ed's solid state Raytheon radio is quite usable at 10 GHz, especially the brick oscillators and the TWT (traveling-wave tube) amplifier (20 watt output), mixers, and waveguide components. The radio's baseband IF system can be bypassed and replaced by a 2 meter HT.

In the above case, if SSB or narrowband FM is desired, the rest of the equipment isn't used. But if TV were used, the entire IF system might be used at 70 MHz. Concerning the antenna feed, it's best to stay with waveguide due to its very low loss. 30 feet of waveguide WR-75 would have about 1.3 dB loss, far better than any coaxial cable. See Ed's license plate in the photo.

Stephen N8JAF in the Dayton area would like to establish a 10 GHz link about three miles away. He'd like to hear from any other microwavers in the Dayton area. Jay N1GBS is collecting components for his microwave station, while Bruce N8IRW is looking for a manual or schematic to an Alfred 654C 7-11 GHz sweep oscillator. He would appreciate any assistance. Andy N6HDS reports that all the BMWs and Porsches react when he goes 10 GHz mobile! Looks like the radar detectors are working just fine.

James Fisher from Sacramento writes, "I am a 'soon to be Novice' radio Ham." He expects to take his exam in a few weeks. He is very interested in microwave communications and is looking forward to experimenting with home-brew microwave equipment. He is especially interested in various technical publications concerning microwave related items. I notified him about the North Texas Microwave Group newsletter. If you're interested in this bi-monthly publication, contact **Wes Atchison WA5TKU, Rt. 4, Sanger, Texas 76266**. Dues are $12 a year.

Wish I could comment on all the letters I've received, but space dictates only a few. Thanks for your support. As always, I'll be glad to answer any questions. Please send an SASE for prompt reply. 73s, Chuck WB6IGP.

Field Day All-Band Antenna

Ready to Use	Tough	Full Legal Power
Fastest Install	Flexible	No Lossy Traps
Coax Feed	Kink-Proof	Low Noise
3000 V Insul		Never Corrodes

QRV- 80-10 51 ft. long $49.95
QRV- 160-10 102 ft. long $59.95
Includes 40-page Tech Manual
Add $5 Post & Handling
Infopack $1
AntennasWest
Box 50062-S, Provo, UT 84605 (801) 373-8425

CIRCLE 302 ON READER SERVICE CARD

NEMAL ELECTRONICS

***Complete Cable Assembly facilities MIL-STD-45208**
***Commercial Accounts welcome- Quantity pricing * Same day shipping most orders**
***Factory authorized distributor for Alpha, Amphenol, Belden, Kings, Times Fiber**

Call NEMAL for computer cable, CATV cable, Flat cable, semi-rigid cable, telephone cable, crimping tools, D-sub connectors, heat shrink, cable ties, high voltage connectors.

HARDLINE 50 OHM

FXA12 1/2" Aluminum Black Jacket	.89/ft
FLC12 1/2" Cablewave corr. copper blk jkt jkt	1.69/ft
FLC78 7/8" Cablewave corr. copper blk jktd	4.25/ft
NM12CC N conn 1/2" corr copper m/f	25.00
NM78CC N conn 7/8" corr copper m/f	54.00

COAXIAL CABLES (per ft)

1180 BELDEN 9913 very low loss	.55
1102 RG8/U 95% shield low loss foam 11ga	.36
1110 RG8X 95% shield (mini 8)	.17
1130 RG213/U 95% shield mil spec NCV jkt	.39
1140 RG214/U dbl silver shld mil spec	1.85
1705 RG142B/U dbl silver shld, teflon ins	1.50
1310 RG217/U 50 ohm 5000 watt dbl shld	.98
1450 RG174/U 50 ohm .100" od mil spec	.14

ROTOR CABLE-8 CONDUCTOR

8C1822 2-18ga and 6-22ga	.21/ft
8C1620 2-16ga and 6-20ga	.39/ft

CONNECTORS-MADE IN USA

NE720 Type N plug for Belden 9913	$3.95
NE723 Type N jack for Belden 9913	4.95
UGC273 BNC-PL259 Adapter-Amphenol	3.00
PL259AM Amphenol PL259	.89
PL259TS PL259 teflon ins/silver plated	1.59
PL258AM Amphenol female-female (barrel)	1.65
UG175/UG176 reducer for RG58/59 (specify)	.22
UG21DS N plug for RG8,213,214 Silver	3.35
UG83B N jack to PL259 adapter, teflon	6.50
UG146A SO239 to N plug adapter, teflon	6.50
UG255 SO239 to BNC plug adapter, Amphenol	3.29
SO239AM UHF chassis mt receptacle,Amphenol	.89
UG88C BNC Plug RG 58,142	1.45

GROUND STRAP-GROUND WIRE

GS36 3/8" tinned copper braid	.39/ft
GS12 1/2" tinned copper braid	.50/ft
HW08 8ga insulated stranded wire	.35/ft
AW14 14ga stranded Antenna wire CCS	.14/ft

All prices plus shipping, $3.00 min, Visa/Mastercard $30 min, COD add $3.00
Call or write for complete price list. Nemal's new 40 page CABLE AND CONNECTOR SELECTION GUIDE is available at no charge with orders of $50 or more, or at a cost of $4 with credit against next qualifying order.

NEMAL ELECTRONICS, INC. 12240 NE 14th Ave. N. Miami, FL 33161
(305) 893-3924 Telex 6975377 24hr FAX (305)895-8178

★ OMAR ELECTRONICS ★

FOR ALL YOUR AMATEUR NEEDS
SPECIAL PRICES on all
MFJ PRODUCTS ★ A.R.R.L. PUBLICATIONS
and other Ham Radio equipment!
VISA 404-760-8846 MasterCard
OMAR ELECTRONICS • Omar Pupo WA8FON
3650 HWY 138 NE Suite C • Loganville, Ga 30249

CIRCLE 7 ON READER SERVICE CARD

1989 CALL DIRECTORY

(On microfiche)
Call Directory $8
Name Index 8
Geographic Index 8
All three — $20
Shipping per order $3
BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703: 894-5777 800: 282-5628

CIRCLE 7 ON READER SERVICE CARD

Amateur Software for the Commodore User

ART-1: A complete interface system for send and receive on CW, RTTY (Baudot & ASCII) and AMTOR, for use with the Commodore 64/128 computer. Operating program on disk included. **$199.00**

AIR-1: A complete interface system for send and receive on CW, RTTY (Baudot & ASCII) and AMTOR, for use with Commodore VIC-20. Operating program in ROM. **$99.95**

SWL: A receive only cartridge for CW, RTTY (Baudot & ASCII) for use with Commodore 64/128. Operating program in ROM. **$64.00**

AIRDISK: An AIR-1 type operating program for use with your interface hardware. Both VIC-20 and C64/128 programs on one disk. **$39.95**

AIR-ROM: Cartridge version of AIRDISK for C64/128 only. **$59.95**

MORSE COACH: A complete teaching and testing program for learning the Morse code in a cartridge.
For C64 or C128. **$49.95**
VEC SPECIAL **$39.95**

G AND G ELECTRONICS
OF MARYLAND
8524 DAKOTA DRIVE, GAITHERSBURG, MD 20877
(301) 258-7373

CIRCLE 372 ON READER SERVICE CARD

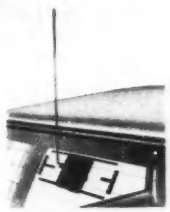
Look at our MOBILE MARK™ "ON WINDOW" Line

PATENTED

VHF (140-175)
- *No Hole*
- *Easy to Mount*
- *Rugged*
- *Superior Performance*
- *Radiator Snaps On and Off*
- *Competitively Priced*

UHF (420-520)
- *3 db gain*
- *No Hole*
- *Easy to Mount*
- *Rugged*
- *Superior Performance*
- *Radiator Snaps On and Off*
- *Competitively Priced*

Cellular/Trunking (800-895 MHz)
- *3db Gain*
- *No Hole*
- *Easy to Mount*
- *Rugged - Goes through Car Wash Without Removal*
- *Superior Performance*
- *Broad Bandwidth*
- *Small Size*
- *Competitively Priced*



MOBILE MARK, INC. COMMUNICATIONS ANTENNAS
3900-B River Road
Schiller Park, IL 60176
312-671-6690

brings imagination and innovation to antennas ..... and has been since 1948 !!

CIRCLE 163 ON READER SERVICE CARD

CIRCUITS

Great Ideas From Our Readers

Copy Better RTTY on the KAM

I came up with this circuit because I was getting a lot of hits on traffic nets using RATT (RAdio TeleType), known as RTTY in the ham circles. I use the Kantronics all-mode (KAM) TNC and the Kenwood TS-440S, which has a good AGC system. It responds however, to only the strongest of the two tones in a RTTY signal. Unfortunately, I've found no way to disable the AGC action in the 440S. Changing the time constant or biasing the radio up a bit with the RF gain control can help reduce the problem, but not defeat it entirely.

Since the problem is selective fade on only one tone at a time, that tone falls below the TTY detector threshold of the KAM and the character fails to print. Curing the problem with an amp may first come to mind, but the input specs of the KAM prevent you from giving it more than a 1 p-p signal. By slightly amplifying the weak tone signal with a single-stage op amp (without letting the strong tone over-drive the detector in the KAM unit), you can achieve improved circuit operation and better printing.

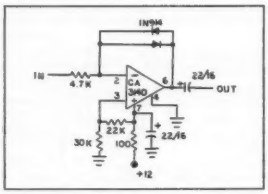


Figure 1.

As long as the output of the op amp is below the barrier potential of the diodes (1N914), the amplifier stage has a gain of 10,000. As pin 6 (output) goes above this level, the feedback through the diodes reduces the gain to less than unity. Consequently, everything, including noise, is amplified and clipped to about 1 volt p-p. This happens on a cycle-to-cycle basis. The limit is soft to the extent that the edges of the output are rounded, minimizing harmonic distortion. Now hits occur only when one of the tones goes completely away; that will simply kill a letter, rather than a whole word.

At first, I used a dual ±12 volt DC supply, but later decided to use the station signal +12 volt DC supply. I used a readily available GE/RCA CA3140 op amp, which is a good op amp with FET input and operates well on a single voltage power supply. The circuit worked better with pin 3 biased to pin 7 rather than to 6 volts DC. Using a 1 µF coupling capacitor, I obtained a differentiated wave shape output, but a 22µF output coupling capacitor solved this problem.

NOTE: This circuit does not work on HF packet. The amplified noise keeps the TNC in the KAM from sensing an open channel, preventing transmission.

Phillip W. Elrod
K4COF/AFA2KQ
Doraville GA

Drive the MM 432/28 with the IC-745

Here's a way to use the 745, or any HF rig that has a minimum output of 10 watts, to drive the Microwave Modules 432/28 transverter. I turned the output all the way down and used a 16 dB attenuator in the output. The accompanying circuit is the attenuator. Refer to the *VHF/UHF Manual* from G. R. Jessop G6JP, published by the Radio Society of Great Britain, for an extensive discussion of this.

Parts: R1, R2 = 68Ω, 1W; R3, R4 = 39Ω, 1W; and R5, R6 = 68Ω, 1/2 W.

Bob Bartelings VE6CBN
Alberta Canada

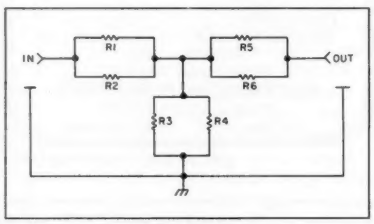


Figure 2.

3-Position, Multi-Mode Switch Box

It's not uncommon to find stations outfitted with RTTY, packet, FAX, and SSTV equipment. A 3-position switch adds convenience and saves time—no more disconnecting and reconnecting.

This control box was designed for the Kenwood TS-830S. It'll also work with the 520, 820, and 530S, and rigs which use a standard 4-pin microphone jack. The circuit consists of a 3-pole, 3-throw (3P3T) nonshorting rotary switch.

Mount the switch on the chassis. I put the cabling and 3-input jacks on the back panel and rotary switch on the front. Follow the pin layout carefully; be sure you don't cross-wire any connections, since you're working from the back of the chassis-mount microphone jacks.

Before using the control box, recheck your work with an ohmmeter. Shorts or cross-wiring could damage your transceiver or any interfacing equipment.

Parts: 3 4-pin chassis mount socket, RS 274-002, $1.29 each; 1 4-pin mike plug, RS 274-001, $1.69 each; 1 metal cabinet, RS 271-251A, $2.99; and 1 3P3T rotary nonshorting switch. Other items include solder, hook-up wire, and single conductor wire with braided shield. For the finishing touch, try DATAK™ transfer lettering and a light coat of clear spray enamel.

No more multi-mode patch cord blues!

David K. Pelaez
4872 Trailside Ct.
Huber Heights OH 45424

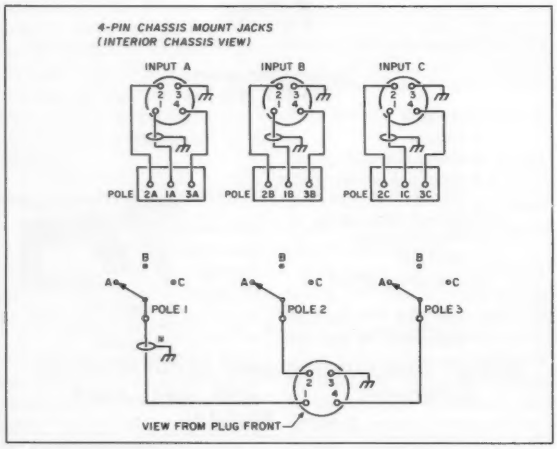


Figure 3.

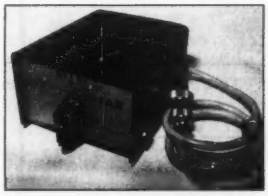


Photo A. Multi-mode controller, front view.

Photo B. Multi-mode controller, back view.

LINK COMM

'LINK COMM' REPEATERS LINK SYSTEMS

RLC – 5

- DIRECT CONNECTION TO THE S-COM 5K REPEATER CONTROLLER
- ADAPTABLE TO ANY REPEATER CONTROLLER
- TWO MODES OF LINKING:
  - CENTRAL HUB LINKING
  - CROSS SYSTEM CHAIN LINKING
- LED DISPLAY PANEL
- LOW POWER CMOS DESIGN

•AFFORDABLE—ONLY $99.95 + $5.00 S&H

AVAILABLE FROM: LINK COMM, 306 SO 20th, BOZEMAN MT. 59715

PC BOARD AND SCHEMATIC LAYOUT SERVICE AVAILABLE, CONTACT LINK COMM FOR ADDITIONAL INFORMATION.

REPEATER LINK CONTROLLER

CIRCLE 47 ON READER SERVICE CARD

Field Day Antenna Installation System

Info $1.00

$29.95 add $5 Air Ship

Pre-assembled Ready for Action Fast & Easy to Use 8 Balloon Climbing

1-801-373-8425

AntennasWest

Box 50062-S, Provo, UT 84605

CIRCLE 304 ON READER SERVICE CARD

NEW ETCHED COFFEE CUPS !!

$7.95 Each BLACK or BLUE
A.R.R.L. LOGO Add $1.00
13 OZ. GLASS MUG AVAILABLE

Checks Payable To:
TODD SKOGEN
P.O. Box 3025
Fox Valley Station
Aurora, IL 60504
(312) 805-5972

Company LOGO's and Custom Orders Welcome Write or Call for Quote. Add $2.50 Ship. & Hand. IL RES. ADD 6.75% TAX Allow 1-2 Weeks Delivery.

CIRCLE 268 ON READER SERVICE CARD

CQ CQ CQ IT'S NEW! POCKETPLATE™ Personalized Key Tags

Not Actual Size
Actual Size 1 3/8" X 9/16"

- Only - $1.50 Ea.

- Minimum Order - two pcs. ($3.00)
- Colors (Black, Brown, Red, or Blue w/White Letters)
- Iowa Residents add 4% Sales Tax.

We Pay Shipping!

TO ORDER YOUR PERSONALIZED KEY TAGS:

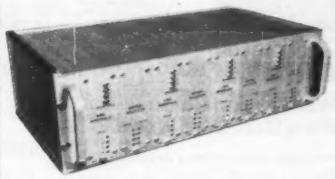
Send Check or Money Order To: Pocketplate™ 801 W. 12 th Ave. North Clear Lake, Iowa 50428

INCLUDE Name, Address, Call Letters, Color of Plates, and Quanity.

Allow 2 Weeks For Delivery
For More Information: Ph. (515) 357-3650

CIRCLE 3 ON READER SERVICE CARD

SIGNAL-TO-NOISE Voting Comparator



Improve coverage by adding receivers

- Expandable to 32 Channels
- Continuous Voting
- 19" Rack Mountable
- Select/Disable Switches for Manual Override
- Can be used with RF Links or Dedicated Lines
- LED Indicators
- Hundreds in Service
- More

— Competitively Priced —

For more information call or write:

Doug Hall Electronics
Voter Dept.
815 E. Hudson St.
Columbus, Ohio 43211
(614) 261-8871

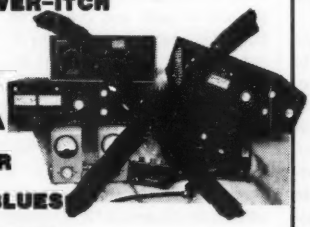
CIRCLE 19 ON READER SERVICE CARD

JANUARY 4, 1983

* *

A CURE WAS FOUND FOR THESE DISEASES :

1. REFLECTED POWER-ITCH
2. KNOB-ITUS
3. QRM-DEAFNESS
4. BUTTON-PHOBIA
5. SWITCH-CANKER
6. SUPER TUNER-BLUES
7. CROSS NEEDLE-EYES



THE CURE* IS:

MAXCOM

AUTOMATIC ANTENNA MATCHER ®
FOR ALL S.S.B. RADIOS

* ONE SHOT GUARANTEED TO LAST AT LEAST FIVE YEARS!

* *

MAXCOM, INC. BOX 502, FT. LAUD., FL. 33302
305-523-6369

* MAXCOM is a registered trademark and is owned by Maxcom Electronics, Inc.

THE BOTTOM LINE: "MAXCOM WORKS"

CIRCLE 101 ON READER SERVICE CARD

AMATEUR TELEVISION

SMILE! YOU'RE ON TV

Only $329

Designed and built in the USA Value + Quality from over 25years in ATV...W6ORG

With our all in one box TC70-1 70cm ATV Transceiver you can easily transmit and receive live action color and sound video just like broadcast TV. Use any home TV camera or VCR by plugging the composite video and audio into the front VHS 10 pin or rear phono jacks. Add 70cm antenna, coax, 13.8 Vdc and TV set and you are on the air...it's that easy!

TC70-1 has >1 watt p.e.p. with one xtal on 439.25, 434.0 or 426.25 MHz, runs on 12-14 Vdc @ .5A, and hot GaAsfet downconverter tunes whole 420-450 MHz band down to ch3. Shielded cabinet only 7x7x2.5". Transmitters sold only to licensed amateurs, for legal purposes, verified in the latest Callbook or with copy of license sent with order.

Call or write now for our complete ATV catalog including downconverters, transceivers, linear amps, and antennas for the 70, 33, & 23cm bands.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD

P.C. ELECTRONICS
2522 Paxson Ln Arcadia CA 91006

Tom (W6ORG)
Maryann (WB6YSS)

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
7 Simpson Court
S. Burlington VT 05403

Walkies and Chips—It's a Mod, Mod World

While researching another article, I recently spoke with Chip Margelli K7JA of Yaesu USA. I mentioned the FT-411's lack of receiver sensitivity on the public service bands, and he described a modification to improve the performance. I tried it and it works, (although not as dramatically as I'd hoped). If your rig is out of warranty and you'd like to do the mod, the section below tells how:

First of all, please don't do this unless you feel competent to do so! This radio incorporates the most up-to-date miniaturization techniques, including extensive use of surface mount technology, and I do not want to be instrumental in anyone's damaging his rig. If you're not sure you're up to it, enlist a friend who is.

FT-411 Modification

Remove the battery pack and the two silver screws on the bottom nearest the front of the radio. Now, remove the two black screws on the back. One is just below the PTT switch and the other is just below the hook for the carrying strap. Now, carefully lift the front panel up from the battery end, then pull gently downward. It'll pop open at the top.

Gently turn it over to the right. It is held by a ribbon cable, and you must not pull hard on it, or it could break. Look down at the circuit board contained in the back half of the radio. There are three small IF cans mounted in a vertical row on the motherboard. Using a small adjustment tool, turn the top two of them fully clockwise, then back them out just a tad. When turning them in, be extremely careful that you don't force them past their natural stopping points, or you may damage the cores or the coils themselves.

That's all there is to it! Close the rig up by fitting the front panel in at the top and then pressing the two halves together. (Don't forget to replace the strap hook first!) Finally, replace the screws.

Chip claims there is little or no effect on ham band reception, and that reception of the public service band frequencies will be significantly enhanced. This seems to be the case with my rig. (In fact, new '411s are being aligned this way at the factory.)

Alignment Tool

By the way, if you don't have a proper plastic alignment tool, you can make a temporary one from a Q-Tip, as long as it's the kind with a wound paper stem. The blue plastic kind doesn't work.

Just cut one end off, then shape the stem end by cutting it with a pair of dikes. It should last long enough to get the job done. One thing I definitely don't recommend is using a screwdriver to adjust coils. The cores are brittle and they can crack very easily if they stick while you're turning them with a screwdriver. A cracked core is a disaster!

Thanks for the Memories

I got a very nice letter from Bob K9JMP, in which he relates an idea suggested by Claude WA9KCU. You can use any walkie that can store independent receive and transmit frequencies in memory to hold extra frequencies, as long as they're just for receiving. Simply program them in as the split transmit frequencies, and then use the "reverse" function to get at them. Voilà—two frequencies in one memory.

Of course, they won't scan, but at least they'll be there. Seems to me the technique should be especially useful when you're traveling and run out of memories in which to place local repeaters. Stash some of your home or public service band frequencies as Claude suggests, and you're ready to go! It's one of those ideas that makes you wonder, "Why didn't I think of that?"

Too Much QRM, OM

Sounds like something you'd hear on 20 meter DX, right? Well, now we have auto-QRM on 2 meter packet as well. No, not QRM from cars. I'm referring to hash from the TNC getting into the rig and making reception difficult or even impossible. It appears to be worst on 145.01 (good old Murphy), and especially seems to be a problem when TNCs are used with walkies.

Unlike mobile rigs, many HTs have partial or even total plastic cases, and the hash can get right into the receiver without benefit of antenna. Toroids on connecting cables, and even remote antennas, may not help. The TNC's clock oscillator generates a harmonic which just happens to fall on 145.01, causing this problem.

The solution is to open up the TNC and look for a trimmer capacitor associated with the clock crystal. Turn it slightly while listening to the receiver, and you should be able to shift the harmonic away from the packet frequencies. TNC operation should not be affected in any way, as the oscillator's frequency change will be very slight.

If your TNC has no trimmer, check the schematic and you should find a fixed capacitor of maybe 47 pF or so, either across or in series with the crystal. Try adding another cap, perhaps 4.7 pF, in parallel with it and that should do it.

Pass the Chips

We all know that our gear is filled with integrated circuits, or chips. Most of us know what they look like. Surprisingly, though, lots of hams have little or no idea what is inside those little black boxes with all the legs. So, let's explore them.

You've heard that chips can contain lots of transistors. How the heck do you fit all those things into something so small? What's more, how do you connect them? Are there little tiny wires or what? Well, sort of, but not quite. There are lots of parts and conductive paths between them, but they're not separate. Instead, they're integrated on a common surface, called a substrate. Hence the name "integrated circuit."

Transistors are made by implanting certain chemicals into a semiconductor surface, usually silicon, in layers. The meeting points of the layers constitute the junctions where the transistor effect occurs. So, why not build these layers on a large area and make many transistors at once? Obviously, simply using a large area would result in one big transistor! Some sort of isolation from area to area is needed to establish a circuit path.

Photography provides the means. If you've ever developed your own film, or made a printed circuit board, you're familiar with the concept of etching. A light-sensitive solution is placed on the material to be etched (for a PC board, that's copper), and then the pattern to be etched is focused on the surface by means of a mask. The areas which receive light chemically harden, while the dark areas do not. A dip in an acid bath leaves only the hardened areas, and the board is ready to be drilled and stuffed with parts.

Essentially the same thing is done with chips, except on a microscopic scale. Starting with silicon, not only the conductive paths, but the parts themselves, are etched onto the chip layer by layer. Chips are really three-dimensional, often with several layers of aluminum conducting paths as well as various multilayer transistors, resistors, and even capacitors. Many chips can be made side by side on the same "wafer," or piece of silicon.

Inside the IC

Getting all this to actually work requires some of the most expensive and sophisticated manufacturing equipment on Earth. The alignment of the masks from layer to layer must be extremely precise, or the circuit elements won't line up. Machines called "wafer steppers" do the job, and each one costs about one million dollars!

At that size scale, the tiniest piece of dust is like a giant boulder, and can obscure a piece of the circuit during the exposure process, rendering the finished chip defective. Elaborate "clean rooms" are used—the cleanest rooms in existence, making the average hospital operating room look positively filthy. All told, millions of dollars' worth of equipment are required to produce even a single chip. ICs are cheap only because so many can be made at once, splitting the cost among millions of chips. If there were only 10 microprocessors in the world, each one would probably be worth about $50 million.

The fundamental limitation on how many parts can be put on a chip is, of course, how small each part can be made. Currently, that is limited by the wavelength of the light used to expose the wafer. Surface features less than one micron (one one-millionth of a meter) in size are now being explored using electron or ion beams instead of light.

Whew! There's lots more to chip making, from the precise "cooking" of the chemicals into the silicon, to the packaging and connecting of leads. But this should give you a good feel for what's inside those leggy little

beasts comprising so much of your radio's innards.

Now let's look at some letters:

Dear Kaboom,

When my son was in Japan, he bought me a Kenwood TH-21. Period. No "A," "AT," etc. The rig has no offset switch at all. Please describe how I can install the plus/minus feature.

Signed,
The Simplex Blues

Dear Simplex,

Wow, that's a tough one! The regular TH-21AT uses separate crystals in one of the heterodyne oscillators, along with some TX/RX switching, to achieve the offsets. Since yours has no offset switch, I would expect that it also doesn't have the supporting offset circuitry. Especially considering the '21's miniaturization level, which includes extensive surface-mounting of parts, it's likely not worth trying.

You'd be better off using the rig for packet (which is a simplex operation) or selling it to someone for that purpose, and getting another HT. But before you do, check to see that the radio is actually designed for simplex use, and does not simply have a fixed offset.

Dear Kaboom,

My old Yaesu Memorizer mobile rig picks up quite a bit of alternator whine, especially in transmit. I can live with it, but I want to know, can it hurt the rig to use it this way.

Signed,
Whine, Whine, Whine

Dear Whine,

It sure can. Alternator whine is caused by spikes on the DC power line. The spikes are caused by the rectified current pulses from the alternator being fed to the car battery. They can be quite large and can damage transistors and ICs in your rig. The cure is fairly simple.

Go to Radio Shack or an auto parts place, and get a noise filter choke. Put it in series with the positive power input to your rig. If there is still some whine, try placing a large filter cap (a few thousand microfarads or more), rated for at least 50 volts, across the radio's power leads, AFTER the choke. Be sure to observe correct polarity when installing the cap, and do it with the positive lead disconnected from the car. That ought to clear it up. 73

Engineering Consulting's computer controlled Ham Shack
See system variables, control & reprogram all via packet!
Ultra Comshack 64 Repeater Controller
HF & VHF Remote Base*Autopatch*CW Practice*Rotor Control
*Voice Meters*Paging*Logging*Polite ID's*Packet Voice B.B.S.

Model CS64S
$ 359.95
Includes: Interface, disk, cables, Manual

Ultra Options

Controller Features
*Change variables remotely from touchtones or Packet
*Unlimited voice vocabulary!
*Alarm Clock, auto execute
*Individual 4 digit user codes
*Disk & Printer logging of users, tel #'s, lapsed time
*18 Rotating Polite ID's
*16 External relay controls
*2, 5, & CTCSS Tone Paging
*CW Practice with voice
*Security mode, T-tone mute
*Voice announces each user call sign when logging on

Autopatch & Reverse
*1000 (18 digit) tel #'s stored
*Quick dial & quick answer
*Directed, general page
*Selected restricted patch
*Telephone control input

Dual Combined Remotes
*18 Macro/Scan memories
*Scan up/down; 100Hz steps
*Monitor & lock modes
*Operate splits, combine HF & VHF radios as Dual VFO's
*Automatic mode selection
*Talking S Meter; Voltmeter
*Voice Beacon rotating msg

Add duplex tel. Remote Base control & 3 way patch..TLCNL. $159.95
External relays; 3 DPDT relays +5 Open Col. Trans. Sw....CS 8..$99.95
*Rotor control D.C. to digital display & Voice; for all rotors....HM1...$59.95
*2 Voice Meters & 2 Alarm Inputs; 8 Relay On/Off Control..PKB.$159.95
*Reprogram & Control via Packet; Packet to Voice B.B.S..PK1....$99.95
*EPROM Autoboot CART....$109.95
*C64 & 1541 12V.Switching supply crystal controlled ....DCPS....$129.95
*Digital Voice Rec/PB 32 or 64 sec. voice Mailbox & ID Tail.DVM $179.95
*Manual (REFUNDED).MN1..$ 20.00

Computer Control
YAESU FT-727R
C64 OR IBM
Mini Cat
Allows H.T. to scan 100 Channels & programs H.T. for field use! Digital "S" Meter; comment fields; auto resume & delay; Scan Lockouts; Loads FT727 in 15 sec. Hardware, cables, & disk included for C64 or IBM
Model 727 $49.95

Touchtone Decoder
4 digit sequence; & QUAD expansion 4 relay option
2"x3"
TSDQ
QUAD
8/20 V & audio in; Field Program 50,000 Codes; Mom. & Latching; DPDT Relay; Wrong digit reset; LED for digit valid & latch; inc. 24 Pin connector
QUAD option adds: four 2 Amp. relays; 5 digit master on/off control for each relay.
TSDQ $89.95 QUAD $99.95

Decode-A-Pad
Touchtone to RS232 300 Baud Interface
Use with all computers
Decodes 16 touchtones
Includes Basic program
DAP $ 99.95

12 Volt C64 SWITCHER
Crystal 60Hz 9VAC 5V. 2A. C64 & 1541
DCPS $129.95

AUDIO BLASTER
AB1S
<--Miniature Audio Amp.
Module installs inside all H.T's; 1 watt audio amp ! When it needs to be loud! Installs in 15 Min. Used by police, fire!
Model AB1S $24.95

IC02; 04;2AT; FT-727; 411; 209; 470; 73/23; U16; TH25

New Digital Voice Recorder
*Records 32 or 64 Sec. studio quality audio
*Use for auto CQ, ID tail, Mailbox, Local or logic control; Up to 16 selectable messages!
Includes: 1 Watt audio amp;1 Meg RAM; Mic & Spkr Jacks, vol. control; Reg. 9 to 12V; Interfaces to Ultra Com Sheck 64 Ver 8.0; Provides Digital Voice CQ, ID tail, Mailbox, bulletins
DVM $179.95

ENGINEERING CONSULTING
583 CANDLEWOOD ST.
BREA, CA. 92621
TELEPHONE: 714-671-2009
FAX: 714-255-9964

We accept: C.O.D.'s MasterCard,VISA,Disc AMERICAN EXPRESS
*add $4.00 S/H U.S.A.
*Ca. residents add 6%

HIGH PERFORMANCE PRESELECTOR-PREAMP

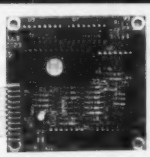
The solution to most interference, intermod, and desense problems in repeater systems.

- 40 to 1000 Mhz tuned to your frequency
- 5 large helical resonators
- Very high rejection
- Low noise—high overload resistance
- 8 db gain—ultimate rejection >80 db
- GaAs fet option (above 200 Mhz)
- Cast aluminum enclosure
- N, BNC, and SO239 connector options

Typical rejection:
±600Khz @ 145 Mhz: 28db
±1.6 Mhz @ 220 Mhz: 40db (44db GaAs)
± 5 Mhz @ 450 Mhz: 50db (60db GaAs)
±20 Mhz @ 800 Mhz: 65db
±20 Mhz @ 950 Mhz: 70db

AUTOMATIC IDENTIFIERS

- Up to 8 EPROM programmed messages
- Adjustable audio, speed & interval timer
- "ID over voice inhibit"
- Low power option
- Modular design
- Message selection via binary input—TTL levels
- Size: 2.7 x 2.6 x 0.7"



NEW Model ID-2B

The ID-2B provides required station identification without troublesome diode programming. The "ID over voice inhibit" circuitry allows for courteous operation by not allowing an ID until the next squelch closing.

ID-2B Wired/Tested $99.95
ID-2B-LP Low Power $109.95

GLB ELECTRONICS,INC.
151 Commerce Pkwy., Buffalo, NY 14224
716-675-6740 9 to 4

CIRCLE 17 ON READER SERVICE CARD

NOW HEAR THIS

FINALLY! High-Powered Sound from your HT.

- 10 DB of Audio Gain
- 3.5 inch Oval Speaker
- Automatic Shut-OFF
- Internal NiCad Charger
- External Power 5-15 VDC

$29.95

Model HTS-1

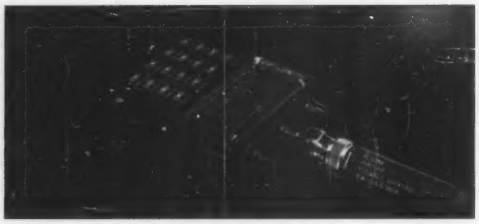
Naval ELECTRONICS INC.
5417 Jet View Circle, Tampa, Florida 33634
Phone: (813) 885-6091 Telex: 289-237 (NAVL UR) Fax: (813) 885-3789

CIRCLE 349 ON READER SERVICE CARD

Number 25 on your Feedback card

NEW PRODUCTS

Compiled by Linda Reneau KA1UKM



PRODUCT OF THE MONTH

ICOM AMERICA, INC.
THE ICOM IC-24AT

Icom's new IC-24AT is super compact at 2"W x 5.4"H x 1.4"D and 12 ounces. The multi-functional, dual-band transceiver delivers a 5W output at 13.8 volts DC. Audio output power is more than 200 mW at 10% distortion with an 8Ω load. It can turn itself on at a preprogrammed time and turn itself off when unused. A battery pack from BP-81 through BP-86, or external DC power jack 6–12V DC, supplies power. Select tuning step increments of 5, 10, 12.5, 15, 20, 25, 50, to 100 kHz, or 1 MHz. Other features include dual-band display, scan and monitor functions, and optional tone squelch function.

The IC-24AT can simultaneously transmit on 144 MHz and receive on 440, or vice versa. The keyboard, complimented by the top panel tuning control, makes it easy to program the 80 memory channels and use the two call channels. You can store frequently used phone numbers in the four DTMF code memory channels for automatic dialing.

Suggested retail, $629.00. *Icom America, Inc., 2380 116th Ave., NE, PO Box C-90029, Bellevue WA 98009-9029. Tel. (206) 454–8155. Customer Service (206) 454–7619. TEL: 152210/ FAX: (206) 454–1509.* Or circle Reader Service No. 201.

COMMAND TECHNOLOGIES, INC.

The Commander HF-2500 high frequency amplifier delivers 1500 watts of continuous carrier output using a pair of Eimac 3CX800A7 triodes requiring 50–80 watts of drive. It operates on 160, 80, 40, 20, and 15 meters, and the WARC bands. With an easy modification, it can perform on 10 meters. Maximum plate dissipation is 1600 watts. It can handle high duty cycle emissions, such as RTTY, SSTV, FM and AM, as well as SSB rag-chewing and CW.

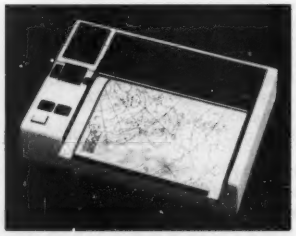
Other features include negative going ALC with easy rear panel adjustment for tuning, harmonic suppression, intermodulation distortion better than 35 dB below rated output, and full-cabinet pressurized forced-air chassis for cooling.

The 70-pound, 17"x16"x7¾" Commander HF-2500 is $2188. *Command Technologies, Inc., 1117 West High Street, PO Box 939, Bryan OH 43506. (419) 636–0443 or Customer Service (800) 736–0443.* Or circle Reader Service No. 202.

TCE LABORATORIES

TCE Labs of San Antonio announces almost 100% of the users of their Model BX TVI filter report no trace of interference. Tom W4PSC, retired research engineer and ham for 52 years, says he designed this filter out of necessity; he had tried every filter available on the market, and his TVI remained unchanged.

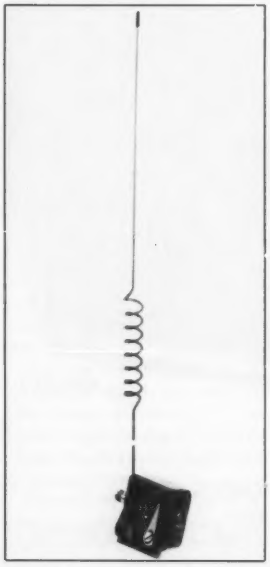
The Model BX TVI filter attaches to the F-connector cable TV input or coax cable VCR input. TCE Labs sells the BX filter for $23, and Model CX for the neighbor's TV or VCR for $18 (shipping included; Texas residents add 8% sales tax). TCE also sells an effective telephone filter for $16 (add $2 S&H, if ordered separately). Send check or MO to *TCE LABS, 5818 Sun Ridge, San Antonio TX 78247.* Or call *(512) 656–3635 for more information or (800) 545–5884 (1800 KILL TVI) for immediate delivery.* Or circle Reader Service No. 203.



ACE COMMUNICATIONS, INC.

The WX-1000 produces hard copy images from radio facsimile services, including NOAA weather chart, NFAX, press photo, and satellite weather pictures from NOAA, GOES, and METEOR, etc. It requires audio output from a shortwave or S-band receiver capable of receiving facsimile signals. The built-in high resolution, 24-pin thermal printer produces crisp images. It's also capable of producing gray scale, ideal for APT (Automatic Picture Transmission) by weather satellite.

Power requirement for this 5.37 kilogram (with paper roll) printer is 120V AC or 13.8V DC. *ACE Communications, Inc., 22511 Aspan Street, El Toro CA 92630-6321. (714) 581–4900 or (800) 523–6366. FAX (714) 768–4410.* Or circle Reader Service No. 204.



THE ANTENNA SPECIALISTS CO.

The Antenna Specialists Co.'s new Model AP-143 "On-Glass"® disguise antenna covers the 2 meter band. It borrows the "pigtail" configuration of cellular antennas to disguise the presence of professional radio equipment inside the vehicle.

The capacitively coupled transmission through glass requires no ground plane and permits quick, no-holes installation. VSWR is less than 1.5:1. Power rating is 100W continuous and 150W intermittent. The 26" stainless steel whip is covered with a black DURA-COAT™ finish. Suggested retail, $65. *The Antenna Specialists Co., 30500 Bruce Industrial Parkway, Cleveland OH 44139-3996. Tel. (216) 349–8400. TLX 4332133.* Or circle Reader Service No. 205.

HEIL SOUND

The Heil BM-5 single-element boomset is one side of the Heil BM-10 dual-headphone boomset. This new BM-5 is great for mobile use in states where dual-element earphones are illegal. The microphone boom is available with either of the Heil "Key Element" cartridges—the HC-5 for full-range response, or the HC-4 "DX Dream Machine."

Price, $65. Contact *Heil Sound, Ltd., Heil Industrial Blvd., Marissa IL 62257. Tel. (618) 295–3000.* Or circle Reader Service No. 208.

GORDON WEST
RADIO SCHOOL

#04 21-DAY NOVICE $22.95

- 112-page textbook
- two stereo code learning tapes
- sample 5 wpm Novice code test
- over $50 in radio manufacturers' discount coupons.

#01 COMPLETE NOVICE . . . $62.95
2 theory tapes, 2 textbooks, FCC Rule Book, 4 code tapes, code oscillator set, examiner test packet, and over $50 in radio discount coupons.

#02 NOVICE CODE COURSE $32.95
6 cassette tapes make it easy to learn the code from scratch.

#07A 2-WEEK TECH $22.95
This Technician course includes 2 theory tapes and 1 illustrated textbook.

#05 COMPLETE GENERAL. . $62.95
6 code tapes, 4 theory tapes, and 2 textbooks. Ideal for upgrade from Novice to General.

#06 GEN. CODE COURSE . . $32.95
This General course includes 6 tapes for speed building from 5 to 13 wpm.

#08B COMPLETE ADVANCED $62.95
This Advanced course includes 4 theory tapes, 1 textbook, and 6 code tapes (13 to 22 wpm).

#09 ADV. THEORY COURSE $32.95
4 tapes and 1 illustrated textbook

#10 COMPLETE EXTRA. . . . $62.95
4 theory tapes, 1 textbook, and 6 code tapes (13 to 22 wpm).

#12 EXTRA THEORY COURSE $32.95
4 theory tapes and 1 illustrated textbook for Extra class theory.

#11 EXTRA CODE COURSE $32.95
6 tapes for speed building from 13 to 22 wpm for the Extra code exam.

#13 BRASS KEY & OSC. . . . $25.95

#15 PLASTIC KEY & OSC. . . $21.95

SINGLE CODE TAPES
$10.95 each including shipping

#19	5 wpm Novice QSO tests
#20	5 wpm Random Code
#21	5-7 wpm Speed Builder
#22	7-10 wpm Speed Builder
#23	10 wpm Plateau Breaker
#24	10-12 wpm Speed Builder
#25	12-15 wpm Calls & Numbers
#26	13 wpm Random Code
#27	13 wpm Test Preparation
#28	13 wpm Car Code
#29	13-15 wpm Speed Builder
#30	15-17 wpm Speed Builder
#31	17-19 wpm Speed Builder
#32	20 wpm Random Code
#33	20 wpm Test Preparation
#34	20 wpm Car Code
#43	3-15 wpm Code Review
#40	12-21 wpm Code Review

Prices include shipping & handling
IL residents add 6½%

VISA MasterCard

RADIO AMATEUR CALLBOOK INC.
925 Sherwood Dr., Lake Bluff, IL 60044
Mon.-Fri. 8-4pm (312) 234-6600

CIRCLE 31 ON READER SERVICE CARD

ATV CONVERTERS • HF LINEAR AMPLIFIERS

DISCOVER THE WORLD OF FAST SCAN TELEVISION

HF AMPLIFIERS per MOTOROLA BULLETINS

Complete Parts List for HF Amplifiers Described in the MOTOROLA Bulletins.

AN758 300W $160.70	EB43 140W $ 89.65
AN762 140W $ 93.25	EB127A 300W $137.20
AN779L 20W $ 83.70	EB104 600W $448.15
AN779M 20W $ 83.10	AR305 300W $383.52
AR313 300W $403.00	

NEW!! 1K WATT 2–50 MHz Amplifier

UNIVERSAL DIGITAL FREQUENCY READOUT
TK–1 (Wired/tested) $149.95

REPEATER CONTROLLER
RC–1000 (Wired/tested) $239.95

HEAT SINK MATERIAL
Model 99 Heat Sink(6.5x12x1.6) ..... $ 22.00
CHS–6 Copper Spreader(6x6x1/4) ..... $ 18.00

We also stock Hard-to-Find parts

AMATEUR TELEVISION CONVERTERS

ATV2 420–450	$ 44.95 Kit
ATV3 420–450 (GaAS–FET)	$ 49.95 Kit
ATV4 902–928 (GaAS–FET)	$ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SIL ..... $ 39.95 Kit

2 METER VHF AMPLIFIERS

35 Watt Model 335A	$ 79.95 Kit
75 Watt Model 875A	$119.95 Kit

Available in kit or wired/tested

POWER SPLITTERS and COMBINERS
2–30MHz

600 Watt PEP 2–Port	$ 69.95
1000 Watt PEP 2–Port	$ 79.95
1200 Watt PEP 4–Port	$ 89.95

100 WATT 420–450 MHz PUSH–PULL LINEAR AMPLIFIER — SSB–FM–ATV

KE867–PK (Kit)	$239.25
KE867–PCB (PC Board)	$ 19.00
KE967–i (Manual)	$ 5.00

For detailed information and prices, call or write for our free catalog.

CHIP CAPS—Kemet/ATC
METALCLAD MICA CAPS—Unelco/Semco
RF POWER TRANSISTORS
MINI–CIRCUIT MIXERS

SBL–1 (1–500Mhz)	$ 6.50
SBL–1X (10–1000Mhz)	$ 7.95

ARCO TRIMMER CAPACITORS

VK200–20/4B RF Choke	$ 1.20
58–500–65–3B Ferrite Bead	$ .20

Broadband HF Transformers

Add $ 3.50 for shipping and handling.

We ship worldwide.

VISA

CCI Communication Concepts Inc.
508 Milestone Drive • Xenia, Ohio 45385 • (513) 426–8600
FAX 513–429–3811

MasterCharge

WE SHIP WORLDWIDE

CIRCLE 99 ON READER SERVICE CARD

"The Epitome of Excellence"

Elevate the status of your repeater with the RC-850 Repeater Controller.

Ever heard a really great repeater? One that sounds superb? Is fun to use? And benefits its users through its wealth of interactive features? Chances are, it's controlled by an ACC RC-850 Repeater Controller. Because more discriminating repeater owners choose ACC controllers for their systems than any other. And the 850 leads the industry in performance.

The '850 is extensively programmable, using interactive Touch-Tone entry and voice response, or a computer terminal. All *remotely!* From access codes to its operating schedule, nearly everything can be easily changed.

The patch supports local and radio-linked phone lines. A three-tiered system offers flexibility in call routing, assignment of privileges and control. The 250 autodial slots support even the largest groups.

The Touch-Tone activated mailbox lets users leave messages for each other. The *system* will leave you messages if you miss a reverse patch or alarm. Paging support includes all popular tone formats so users can always be available without having to listen.

Multi-band linking extends your repeater's range, ties your repeater to others for emergency and public service activities, and lets you benefit from the elevation of your repeater site for working all bands. Individual user codes offer secure access to selected functions to bar unauthorized use.

The top-of-the-line '850 distinguishes itself as a stellar performer on hundreds of repeaters. And it can do the same for you. Learn more about how to enrich your repeater system by contacting us directly.

acc advanced computer controls, inc.

2356 Walsh Avenue, Santa Clara, CA 95051 (408) 727-3330

CIRCLE 1 ON READER SERVICE CARD

ENGINEERING CONSULTING

Engineering Consulting now has the "Packet Talker," model PKTA, for the Commodore 64 and compatibles. "Packet Talker" converts ASCII messages into speech. You can store messages for up to 300 users and retrieve them with TouchTone commands, and use the "Packet Talker" to link your TNC with any voice repeater.

A similar option for the PK8 and PK1 TNCs is available for the Ultra Com Shack 64 repeater controllers. Used with the Ultra, the "Packet Talker" is much more powerful, allowing complete control of the repeater, remote screen transfer of all active parameters, voice message, and remote programming.

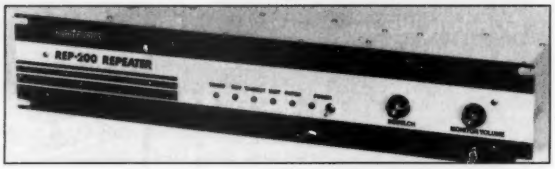
Model PKTA provides hardware and software interfacing for the C64. It sells for $190. *Engineering Consulting, 583 Candlewood St., Brea CA 92621. Tel. (714) 671–2009. FAX (714) 255–9984.* Or circle Reader Service No. 206.

PHILLYSTRAN®

Phillystran's nonmetallic, maintenance-free tower guys eliminate distortion caused by re-radiated signals. No insulators are required for these electrically transparent guys, and they are immune to corrosion, stretching, arcing, zapping, snapping, and aging problems.

Phillystran tower guys are protected by an extruded olefin copolymer jacket. To prevent damage by fire or vandals, Phillystran recommends that you use short lengths of steel cable in the lower portion of each guy.

For more details on Phillystran® HPTG rope, tower preparation, and SOCKETFAST® BLUE, the resin potting compound used to terminate HPTG rope, contact *Phillystran, United Ropeworks (USA), Inc., 151 Commerce Drive, Montgomeryville PA 18936. Tel. (215) 368–6611. TLX: 846342. FAX (215) 362–7956.* Or circle Reader Service No. 207.



HAMTRONICS, INC.

Hamtronics' new REP-200 repeater has everything their existing repeaters have, plus a microprocessor-controlled COR, CWID, autopatch, and DTMF decoder/controller with over 45 functions, including built-in testing features. It's available for 10m, 6m, 2m, 220 MHz, 440 MHz, 902 MHz, and for HF and UHF commercial bands.

Four PCBs have been combined into one module, with IC sockets for easy service. Surface mount capacitors reduce size and enhance performance. Interconnections through the controller board eliminate cable harnesses. External cables are made with push-on terminals which plug directly into the controller board. Added front panel indicators and color-coded LEDs indicate status of major functions. Welded RF partitions are part of the new compact chassis, with Pem nuts sealing the covers for shielding.

For 2m and adjacent commercial band, a new 25W RF output option is available. If you need even more power, you can add the 100W PA. On UHF, choose from 10W with basic repeater or up to 65W with add-on PAs. On 900 MHz, choose 10W basic repeater or 40W with add-on PA.

The REP-200 is $1295. *Hamtronics, Inc., 65-F Moul Rd., Hilton NY 14468-9535. Tel. (716) 392–9430/FAX 9420.* Or circle Reader Service Number 209.

LETTERS

From the Hamshack

Appeal for Young Hams

I've heard about your call for youth in ham radio. I am an eighteen-year-old General class licensee, and am very concerned about the future of ham radio. Ham radio has been around since before World War I, and is still strong, but the old guard slowly dwindles and there are not enough young adults to carry on the ham radio tradition.

It's everyone's responsibility to get young people involved before it's too late. We need to show them there's more to life than parties or who's wearing what. We need to open their eyes to the wonderful world of ham radio. How?

Show them how special they are. Show them that they can get on a radio and talk to anyone in the world. Get them involved in public service, such as in events that demand communications, like parades, 10k races, etc. Yes, it will not be easy at first, but now is the time to really start searching for them, especially with no-code in progress. If we could get them to put as much energy into ham radio as they do with parties and fashion, then the hobby will be carried from generation to generation. The young folks are who we really need to shoot for, and the way to be successful is to show them how valuable they really are in this world of ours.

Kelly Howard N6PNY
Saugus CA

Closer Look at ROSE

I would like to address some of the comments made about ROSE in the article "Amateur Packet Networking" in the October '89 Packet Issue. It is stated that, "The . . . protocol used . . . is called AX.25 because it is based on the worldwide computer networking protocol X.25." AX.25 actually is only a small portion of X.25. The original authors of the AX.25 protocol wanted to include the full features of X.25 because in many countries X.25 MUST be used for networking.

"The major advantage of ROSE is that it is available from RATS at little or no cost." We should not evaluate networking solutions using cost as a major consideration. Technical merits of a solution might be more important.

It is stated that the major problem with VC-based networks is that "a disconnect anywhere along the line breaks the entire link to the destination." One factor overlooked is that the VC method reduces BBS message duplication greatly. This is one of the real advantages of ROSE.

"ROSE can't communicate with NET/ROM, NET/ROM can't . . . TexNet, and TexNet can't . . . ROSE, etc." This is true only on the network level. On the AX.25 level, they communicate quite well. In New Jersey, we forward at least 1000 messages each month between ROSE and NET/ROM networks on the AX.25 level.

I personally feel that networks based upon "the worldwide computer networking protocol" should be given serious consideration if we are to ever create a global amateur packet network.

Thomas A. Moulton W2VY
Clifton NJ

See the Packet Talk column by Brian Lloyd WB6RQN in this issue for clarification of misleading statements in the October '89 packet issue . . .

Linda KA1UKM

Make it Fun

Until your editorial about high school ham clubs, I didn't know we started a high school ham club in tough times in 1972. Four of us were already hams and we convinced my physics teacher to be our faculty advisor. We showed how learning the code and theory was fun. We provided communications for school competitions. The last time I checked the Callbook, our club callsign, WB4DDF, was still listed. Emphasize ham radio as fun, and you will get positive results.

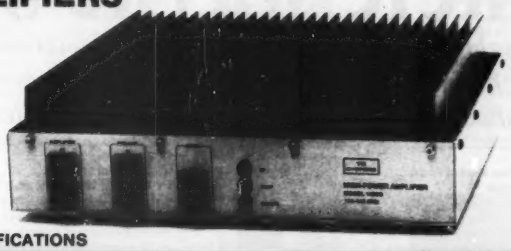
Steven Putman N8ZR
Fairborn OH

TE SYSTEMS

RF POWER AMPLIFIERS

NEW!

400 WATTS (144-148 MHz)



TE SYSTEMS new **HPA Series** of high power amplifiers now available through select national distributors.

All amplifiers are linear (all-mode), automatic T/R switching, and incorporate optional GaAs FET preamp. Amps are usable with a wide input drive level range. Thermal shutdown protection and remote control capability included. All units are designed to ICAS ratings and meet FCC part 97 regulations. Approx. size is 2.8 × 10 × 11.5″ and weight is 8 lbs.

Consult your local dealer or send directly for further product information.

SPECIFICATIONS

Model	Freq. MHz	Power Input	Power Output	Preamp NF-dB	Preamp Gain-dB	DC +Vdc	Power A	RF Conn
0550G	50-54	10	280	6	15	13.6	42	UHF
1450G	144-148	10	400	6	15	13.6	54	UHF
1452G	144-148	25	400	6	15	13.6	50	UHF
2252G	220-225	25	250	.7	14	13.6	36	UHF
4450G	420-450	10	180	1.1	12	13.6	39	N
4452G	420-450	25	180	1.1	12	13.6	36	N

Models also available without GaAs FET preamp (delete G suffix on model #). All units cover full amateur band – specify 10 MHz bandwidth for 420-450 MHz amplifier. Continuous duty repeater amps also available.

Amplifier capabilities: 100-200 MHz, 225-400 MHz, 1-2 GHz, Military (28V), Commercial, etc. also available – consult factory.

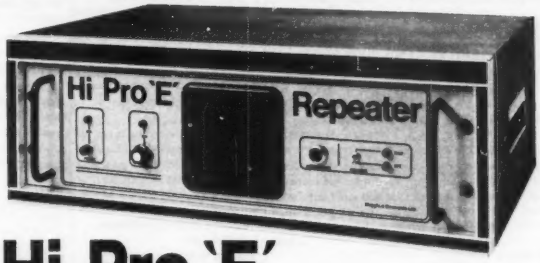
TE SYSTEMS
P.O. Box 25845
Los Angeles, CA 90025
(213) 478-0591

CIRCLE 232 ON READER SERVICE CARD

Hi Pro Repeaters
ELCO
MAGGIORE ELECTRONIC LAB.

Manufacturers of Quality Communications Equipment

- Repeaters
- Links
- Remote Base
- VHF,UHF
- Receivers
- Transmitters
- Antennas



- Standard and Computerized Controllers
- Standard and Computerized Auto Patches
- Duplexers

Hi Pro 'E' EXPANDABLE REPEATER SYSTEM

- A NEW CONCEPT IN REPEATER DESIGN, THE Hi Pro "E" IS AN EXPANDABLE REPEATER WITH THE FOLLOWING FEATURES: A BASIC REPEATER WHICH WOULD INCLUDE A COMPLETE RECEIVER, TRANSMITTER, COR, FRONT PANEL CONTROLS AND INDICATORS, LOCAL SPEAKER AND MIC JACK AND CAPABLE OF FUTURE EXPANSION. ALL HOUSED IN AN EXTREMELY RUGGED, ENCLOSED, 19-INCH RACK MOUNTABLE CABINET.
- THIS SYSTEM CAN BE EXPANDED AT TIME OF PURCHASE OR CAN BE AN AFTER-PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.
- AN EXTENSION PANEL IS AVAILABLE FOR LOCAL MONITORING OF THE REPEATER AND CONTAINS ALL NECESSARY METERING, STATUS LIGHTS AND INDICATORS. ALL ADD ONS ARE AVAILABLE FROM THE COMPANY AND ARE COMPLETE INCLUDING INSTRUCTIONS.

MAGGIORE ELECTRONIC LAB.
600 Westtown Rd. West Chester, PA 19382 Phone (215) 436-6051 Telex 499 0741 MELCO

WRITE OR CALL FOR OUR COMPLETE CATALOG

Uncle Wayne's Bookshelf

Aw right, a'ready! NOW, the popular electronics and amateur radio books you've been hounding poor old Uncle Wayne for are here! Now you can build up your hamshack library with these soft-cover favorites . . .

01P22 • **The Packet Radio Handbook**
by Jonathan L. Mayo KR3T
". . . an excellent piece of work. Well worth reading for both the experienced and the new packateer . . . the definitive guide to amateur packet operation."
—Gwyn Reedy W1BEL
Only $14.50

03C09 • **Shortwave Clandestine Confidential**
by Gerry L. Dexter
Fascinating reading—new book covers all clandestine broadcasting, country by country—tells frequencies, other unpublished information—spy—insurgents—freedom fighters—rebel—anarchist radio—secret radio—covers all. Current publication. 84 pages. **$8.50**

01B65 • **The Beginner's Handbook of Amateur Radio—2nd Editon**
by Clay Laster
Combines theory and practice in an easy-to-understand format, and provides information for choosing and installing radio receivers and transmitters, antennas, transmission lines, and test equipment. 400 pages, 291 illustrations. **$16.50**

Lanze Code Preograms—(Available on 5¼" disk.)

Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part #	Commodore Part #	Price
Novice	IBM01	COM01	$14.95
Tech	IBM02	COM02	$14.95
General	IBM03	COM03	$14.95
Advance	IBM04	COM04	$19.95
Extra (New Pool)	IBM05	COM05	$19.95

16S42 • **Shortwave Propagation Handbook**
by George Jacobs W3ASK and Ted Cohen N4XX
New revised edition. Contains up-to-the minute information and charts, and guides you through producing your own propagation data. 154 pages, paperback. **$9.95**

01P044 • **44 Power Supplies for Your Electronic Project**
by Robert J. Traister and Jonathan L. Mayo
Written at the basic level, perfect for the beginner. The reader is given enough electronic theory to understand the concepts explained throughout the book. **$15.95**

10W020 • **N6RJ Original 2nd Op** *by Jim Rafferty N6RJ*
A new edition in an easy-to-use "wheel" format. Simply dial the prefix and instantly have available Beam headings, Continent identifications, Zone idenfication, Postal rates, and more. **$8.95**

16PB6 • **Packet User's Notebook**
by Buck Rogers K4ABT
Over 90 diagrams show tried and true connections for popular TNCs, transceivers, and computers. A genuine nuts-and bolts how-to-do manual. Brand new! **$9.95**

09D22 • **The World Ham Net Directory**
by Mike Witkowski
New—second edition now over 600 net listings. This book introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

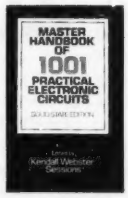
02D42 • **The Digital Novice**
by Jim Grubbs K9EI
Your guide to the fascinating worlds of communication that have just opened for thousands of amateur radio operators. Now you can learn about everything from Morse code to the latest in packet radio technology. **$8.50**

05A95 • **Easy-up Antennas for Radio Listeners and Hams** *by Edward M. Noll*
Would you like to learn how to construct low-cost, easy-to-erect antennas? *Easy-up Antennas* will help you do just that. **$16.50**

01D40 • **DX Power: Effective Techniques for Radio Amateurs**
by Eugene B. Tilton K5RSG
256 pages, 10 illustrations. **$9.50**

02C30 • **The Commodore Ham's Companion**
by Jim Grubbs K9EI
160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

05C25 • **Basic AC Circuits**
by Stanley R. Fulton/ John Rawlins
A step by step approach for the beginning student, technician, or engineer. Covers concepts, terms, and mathematics required to understand AC circuit problems in an easy to read format. **$24.50**



01C80 • **Master Handbook of 1001 Circuits—Solid-State Edition**
by Kendall Webster Sessions
With this outstanding reference in hand, electronics hobbyists and professionals will never have to search for schematics again. Completely updated, the book is thoroughly indexed and all 1001 circuits are clearly illustrated. 420 pages. **$19.59 soft cover**

05H24 • **Radio Handbook, 23rd Edition**
William I. Orr W6SAI
This book is filled with 840 pages of everything you wanted to know about radio communication. You will get an indepth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50 hard cover only**

03R01 • **World Press Services Frequencies (RTTY)**
by Thomas Harrington W8OMV
A comprehensive manual covering Radioteletype news monitoring—contains all information—antenna, receivers, terminal units, plus three extensive frequency lists. Covers 65 World Press Services broadcasting in English. "The Original Press Book." 84 pages. **$8.50**

05E03 • **First Book of Modern Electronics Fun Projects**
Edited by Art Salsberg
Looking for a way to have fun, increase your technical expertise, and save money—all at the same time? This unique compendium, chock-full of projects, will show you how. **$19.50**

05C63 • **Commodore 64 Troubleshooting & Repair Guide**
by Robert C. Brenner
This book will guide you step by step through the complexities of making simple repairs to your Commodore 64. **$19.50**

05C16 • **C64/128 Programs for Amateur Radio & Electronics** *by Joseph Carr*
The electronics hobbyist, programmer, engineer, and technician will enjoy the task-oriented programs for amateur radio and electronics in this book. **$14.50**

ARRL BOOKS

AR2200 • **Antenna Impedance Matching**
by Wilfred N. Caron
For the advanced amateur, antenna design engineer, and technician. This is probably the most comprehensive book ever written on the use of Smith Charts in solving impedance matching problems. **$15.00**

AR2472 • **Tune in the World with Ham Radio Kit (8th ed)**
Brand New Edition. Easier to read, revised text covers the question pools on Novice exams given on November 1, 1989 and later. Code-teaching and code-practice cassettes are included in the kit. **$19.00**

AR2464 • **Tune in the World** Book only. **$14.00**

AR2197 • **Data Book**
This handy reference is a valuable aid to the RF deisign engineer, technician, radio amateur, and experimenter. Commonly used tables, charts, and those hard-to-remember formulas. **$12.00**

ARA341 • **Interference Handbook**
This 250-page book is written from an RFI sleuth's perspective and is a diary of his experience in solving interference problems. **$12.00**

AR1662 • **ARRL 1989 Handbook**
The 1200-page sixty-sixth edition contains over 2100 tables, figures, and charts. The *Handbook* is packed with component data and construction articles. **$21.00**

AR0402 • **Solid State Design**
Solid State Design is chock full of good, basic information—circuit designs and their applications, and descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR2065 • **ARRL Antenna Book**
The *ARRL Antenna Book* represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$18.00**

AR1086 • **ARRL Operating Manual**
The *ARRL Operating Manual* is packed with information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF, contesting. **$15.00**

AR1250 • **Log Book—Spiral** **$2.50**

AR226 • **Operating An Amateur Radio Station**
This booklet is designed to answer the basic questions the beginner may have. Equipment, antennas, and procedures are covered. **$1.00**

AR2286 • **First Steps in Radio** *by Doug DeMaw W1FB*
Series of QST articles. You will find basic explanations of circuit components: See these components assembled into practical circuits and see how the circuits make up your radio gear. **$5.00**

AR0471 • **Transmission Line Transformers**
by Dr. Jerry Sevick
This book covers types of windings, core materials, fractional-ratio windings, efficiences, multiwinding and serial transformers, baluns, limitations at high impedance levels and test equipment. **$10.00**

AR0194 • **Antenna Compendium**
Materials on verticals, quads, loops, Yagis, reduced size antennas, baluns, Smith Charts, Antenna polarization, and other interesing subjects. **$10.00**

AR0488 • **W1FB's Antenna Notebook**
by Doug DeMaw W1FB
Tells how to get the best performance out of unobtrusive wire antennas and verticals and how to build tuner and SWR bridges. **$8.00**

ARRL License Manual
Beginning with *Tune in the World with Ham Radio* for the Novice and progressing through the critically acclaimed *ARRL License Manual* series for the Technician through Extra Class; you will find passing each exam element a snap! There are accurate text explanations of the material covered along with FCC question pools and answer keys.
AR0143 • **Technician/ General Class License Manual** **$5.00**
AR0166 • **Advanced Class License Manual** **$5.00**
AR2391 • **Extra Class License Manual** **$8.00**

AR0410 • **Yagi Antenna Design**
Ham Radio published a series of articles on Yagis. The material from these articles that is presented here was polished and expanded by Dr. Lawson. **$15.00**

AR2073 • **Novice Antenna Notebook**
Novices will learn, among other things, how antennas operate, and what governs their effectiveness for short- and long-distance communication. **$8.00**

AR0437 • **ARRL Repeater Directory 1989–1990**
This edition is 14% larger and includes over 475 beacons covering frequencies from 14 MHz to 24 GHz. You'll also find over 13,300 regular repeater listings and over 2200 digipeaters. **$5.00**

AR2083 • **Complete DX'er** *by Bob Locker W9KNI*
You'll learn how to hunt DX and how to obtain hard-to-get QSL cards. **$10.00**

AR0477 • **Low Band DXing**
This book shows you how to meet the challenges of the different forms of 160, 80, and 40 meter propagation with effective antennas, equipment, and operating strategies. **$10.00**

AR2030 • **Your Gateway to Packet Radio**
Filled with information for all amateurs, this book tells everything you need to know about this popular new mode: how to get started, equipment you need, and more. **$10.00**

AR2456 • **FCC Rule Book (8th ed)**
This New Edition is almost 50% fatter. The tutorial chapters in the front of the book are a major upgrade over the previous editons. A must for every active radio amateur. **$19.00**

AR2171 • **Hints and Kinks**
You are sure to find the answer to that tricky problem that has been bothering you. Ideas for setting up your gear for comfortable and efficient operation. **$5.00**

AR2103 • **Satellite Anthology**
You'll find the latest information on OSCARs 9 through 13 as well as the RS satellites. Information on the use of digital modes, tracking, antennas, RUDAK, microcomputer, and more! **$5.00**

AR0046 • **Satellite Experimenters Handbook**
Under one cover is what the Amateur Radio Operator needs to know in order to communicate through OSCAR satellites. **$10.00**

05E00 • **Solid-State Projects You Can Build**
by Rudolf F. Graf/ George J. Whalen
Have you searched for challenging innovative projects, imaginatively designed and skillfully debugged to stimulate your own creative thinking? If so, this book was written for you! **$10.50**

03R02 • **RTTY Today**
by Dave Ingram K4TWJ
The new and only up-to-date RTTY book in existence. Covers all facets of RTTY—RTTY and Home Computers—most comprehensive RTTY guide ever published. Fully illustrated. A must for RTTY fans. 112 pages. **$8.50**

04M54 • **GGTE Morse Tutor**
Floppy disk for IBM PC, XT, AT, and compatibles. Learn the International Morse code or improve your capabilities. One diskette will take you from beginner through extra class in easy self-paced lessons. Standard or Farnsworth mode. Code speeds from 1 to over 100 words per minute. **$19.50**

02C30 • **The Commodore Ham's Companion**
by Jim Grubbs K9EI
160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

03M221 • **US Military Communications (Part 1)**
Deals with US Military communication channels on shortwave. Covers frequencies, background on point to point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. 102 pages. **$12.95**

03M222 • **US Military Communications (Part 2)**
Covers US Coastguard, NASA, CAP, FAA, Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. 79 pages. **$12.95**

03M223 • **US Military Communications (Part 3)**
This part completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. 78 pages. **$12.95**

10A343 • **All About Cubical Quad Antennas**
by William Orr W6SAI/ Stuart Cowan W2LX
The "Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$9.50**

10A344 • **The Radio Amateur Antenna Handbook**
by William Orr W6SAI/ Stuart Cowan W2LX
Yagi beam theory, construction, operation. Wire beams. SWR curves. Matching systems. A "must" for serious DXers. **$11.50**

10A346 • **Simple, Low-cost Wire Antennas for Radio Amateurs**
by William Orr W6SAI/ Stuart Cowan W2LX
All New! Low-cost, multi-band antennas; inexpensive beams. "Invisible" antennas for hams in "tough" locations! New data. **$11.50**

10A342 • **All About Verticle Antennas**
by William Orr W6SAI/ Stuart Cowan W2LX
Effective, low-cost verticals 10–160 m. -DX, multiband; compact verticals for small spaces; grounding; test equipment; lightening. **$10.50**

10A347 • **All About VHF Amateur Radio**
by William Orr W6SAI
DX propagation, VHF Yagi and Quad beams, repeaters and how they work, OSCAR satellites and how to use them. **$11.95**

16A24 • **Vertical Antenna Handbook, 2nd edition**
by Paul H. Lee N6PL
A classic. Reprinted with updates, including an addendum on antenna design for 160 meters. Also, feeding and matching, short verticals, ground effects, and more.
139 pages, paperback. **$9.95**

09V11 • **The Basic Guide to VHF/UHF Ham Radio**
by Edward M. Noll
This book provides a first rate introduction to life on the 2.6 and 1.25 meter bands as well as 23, 33, and 70 CM. **$6.50**

• **Basic Electricity/ Electronics**
by Robert R. Manville
In this basic electricity/electronics series of textbooks, a modern programmed format is used to present the material in a logical and easy-to-understand way.
05E01 • **Vol. 1** introduces the student to the basic concepts of circuit fundamentals. **$11.50**
05E02 • **Vol. 2** (How AC/DC Circuits Work) This volume builds on the basics. It gives detailed information on series and parallel circuits; effects on inductance, capacitance, and transformer action. **$11.50**

05E94 • **Crash Course in Electronics Technology**
by Louis E. Frenzel Jr.
With a proven format of programmed instruction, this book teaches you the basics of electricity and electronics in a step-by-step, easy-to-understand fashion. **$21.50**

01B033 • **Talk To The World: Getting Started In Amateur Radio** *by James P. Dux K3JD and Morton Keyser N3MK*
Provides information and practical tips on obtaining a novice license. Authors take the mystery out of technical and procedural aspects of ham radio. **$14.95**

05E51 • **One Evening Electronics Projects**
by Calvin R. Graf and Richard S. Goss
16 projects that can be assembled in a simple home workshop, a voltage detector, solid-state telephone bell, a transistor audio amplifier, and 13 others. This is an easy to understand, enjoyable guide to completing basic electronics projects—with just one evening's work. **$8.50**

08W87 • **Weather Satellite Handbook**
by Dr. Ralph E. Taggart
Dro. Taggart has written this book to serve both experienced amateur satellite enthusiast and the newcomer. Amateur weather satellite activity represents a unique blend of interests encompassing electronics, meterology, and astronautics. **$16.95**

05P67 • **Mastering Packet Radio: The Hands-on Guide**
by Dave Ingram K4TWJ
Packet radio is the hottest, most rapidly expanding area of amateur communications. Written for the amateur enthusiast, mastering Packet Radio will put you on the cutting edge of this digital communications revolution. **$12.50**

01T01 • **Transmitter Hunting: Radio Direction Finding Simplified**
by Joseph D. Moell K0OV and Thomas N. Carlee WB6UZZ
336 pages, 248 illusts. **$17.50**

05E53 • **ABC's of Electronics**
by Earl Jacob Waters
Learn the basics of electronics. A comprehensive, well illustrated look at the fundamentals of electronics and applications. **$12.50**

05S19 • **Shortwave Radio Listening with the Experts**
by Gerry L. Dexter
Do you sit for long hours in front of a radio receiver listening to faint sounds and noises? Then you're a SWLer or DXer, and you can probably use some help. **$22.50**

15S003 • **Communications Satellites (3rd Edition)**
by Larry Van Horn
Includes chapters on channelization band plans, transponder identification, international satellites, and more. **$7.00**

03S04 • **The Hidden Signals on Satellite TV**
by Thomas P. Harrington and Bob Cooper Jr.
New book shows and tells how to tune in the many thousands of Telephone, Data, Telex, Teletype, Facsimile Signals on most of the TV Satellites, covers equipment, hookups, where to tune. Only book covering these secret signals on the satellites, plus all subcarriers. 234 pages. **$19.50**

06S57 • **1990 Pussport to World Band Radio**
by International Broadcasting Services, Ltd.
You can have the world at your fingertips. You'll get the latest station and time grids, the 1990 Buyer's Guide and more. 384 pages. **$14.50**

THE WORLD $4.00

How can the World's Best DX Map cost only $4.00? Obviously, a serious blunder which you should take advantage of before we discover it. This is the only world map in black and white so you can color in the countries as you work them! Further, it has almost all of the official IARU 400 countries on it, which no other map at any price has.

"If a single book can shatter the stereotype of the stuffy scientist, this is the one." —*Detroit Free Press*

"...funny, brilliant, bawdy ...Readers will find Feynman enormously entertaining." —*The New Yorker*

"Dick went through life noticing things which didn't quite fit into accepted dogma." —Never Say Die, *73 Magazine* Oct '89

"Surely You're Joking, Mr. Feynman!"
by Richard P. Feynman
18G01 • Great book, great price!
Paperback. **$8.95**

CODE TAPES

One answer to the no-code brou-ha-ha is to make the code so simple to learn that it's a non-problem. Herewith the world's easiest code course—tens of thousands of hams have gotten their licenses this amazing new shortcut way. It's failure-proof. Most people are able to whip through the Novice test after spending less than three hours each on Genesis and The Stickler. People who have given up on other code courses find this one does the job in a jiffy. Going after your General? It's about time. Use the Back Breaker and you'll be there before you know it. A week should do it. Warning, 20wpm code almost invariably appears to cause irreparable, irreversible, permanent brain damage. Uncle Wayne accepts no responsibility whatever for anything that happens to those who are foolish enough to use the Courageous 20wpm tape.

73T05 **"Genesis" $5.95**
5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

73T13 **"Back Breaker" $5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

73T06 **"The Stickler" $5.95**
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

73T20 **"Courageous" $5.95**
20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run: You'll wonder why the examiner is sending so slowly!

Uncle Wayne's Bookshelf Order Form

You may order by mail, telephone, fax, or our Bulletin Board. All payments are to be in US funds. Please add $2.50 for shipping and handling for all orders. Allow 3 weeks for delivery.

Item #	Title	Qty.	Price	Total

Shipping 2.50
TOTAL

Name _____
Street _____
City _____ State _____ Zip _____
TOTAL $ _____ ☐AE ☐MC ☐VISA ☐Check/Money Order
Card # _____ Expiration Date _____

Telephone: (603) 525–4201
FAX: (603) 525–4423
Bulletin Board: (603) 525–4438

Mail: *73 Magazine*, Attn. Uncle Wayne, Forest Road, Hancock, NH 03449

DEALER DIRECTORY

CALIFORNIA

Burbank

Free QSL Cards on orders over $100!! Discount prices on all amateur products. Open 7 days a week. Call our Bulletin Board. **A-TECH ELECTRONICS, 1033 Hollywood Way, Burbank CA 91505; (818) 845–9203, (818) 846–2298 FAX, (818) 846–6746 Modem/BBS.**

San Diego

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 9222 Chesapeake Drive, San Diego CA 92123; (619) 279–6802.**

COLORADO

Denver

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 5115 N. Federal Blvd. #32-B, Denver CO 80221; (303) 458–5444.**

DELAWARE

New Castle

Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720; (302) 328–7728.**

IDAHO

Preston

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Over 9,000 ham related gear in stock. Call us for "all" your ham needs today. **ROSS DISTRIBUTING Co., 78 S. State, Preston ID 83263; (208) 852–0830.**

KANSAS

Wellington

We have it! ASTRON, BUTTERNUT, ENCOMM, HEATHKIT, GORDON WEST, KANTRONICS, LASER COMPUTERS, MFJ, RADIO SHACK, TEN-TEC, VALOR ANTENNAS & more. Small town service with discount prices. **DANDYS, 120 N. Washington, Wellington, KS. 67152, (316) 326–6314.** Circle Reader Service 263 for more information.

MISSOURI

St. Louis

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 8123 Page Blvd., St. Louis MO 63130; (314) 427–6116.**

NEW HAMPSHIRE

Derry

Serving the ham community with new and used equipment. We stock and service most major lines: AEA, Astron, B&W, Bencher, Cushcraft, Hustler, ICOM, Kenwood, KLM, Larsen, MFJ, Mirage, Vibroplex; books, rotors, cable and connectors. Business hours Mon.–Sat. 10–5, Thursday 10–7. Closed Sun./Holidays. **RIVENDELL ELECTRONICS, 8 Londonderry Road, Derry NH 03038; (603)434–5371.**

NEW YORK

Jamestown

Western New York's finest amateur radio dealer featuring ICOM–Larsen–AEA–Hamtronics–Astron. New and used gear. 8 am to 5:30, Sat. and Sun. by appointment. **VHF COMMUNICATIONS, 280 Tiffany Ave., Jamestown NY 14701, (716) 664–6345.** Circle Reader Service number 129 for more information.

Manhattan

Manhattan's largest and only ham and business Radio Store. Featuring MOTOROLA, ICOM, KENWOOD, YAESU, AEA, SONY, BIRD, TEN-TEC, etc. Full stock of radios and accessories. Repair lab on premises. Open 7 days M–F, 9–6:30 pm; Sat & Sun, 10–5 pm. We ship worldwide. **BARRY ELECTRONICS, 512 Broadway, New York NY 10012; (212) 925-7000. FAX (212) 925-7001.**

NORTH CAROLINA

Greensboro

10a.m. to 7p.m. Closed Monday. ICOM our specialty–Sales & Service. Also (to name a few): Ten-Tec, Yaesu, Kenwood, Bencher, Sangean, B&W, MFJ, Alinco, Comet, Sure, Callbooks, Ameco. Frank N4AZM, Mae KB4IMX. **F&M ELECTRONICS, 3520 Rockingham Road, Greensboro NC 27407; (919) 299–3437.**

OHIO

Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Ten-Tec, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq.ft. store. Large SWL department, too. **UNIVERSAL AMATEUR RADIO, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068; (614) 866–4267.**

PENNSYLVANIA

Trevose

Authorized factory sales and service. KENWOOD, ICOM, YAESU, featuring AMERITRON, B&W, MFJ, HYGAIN, KLM, CUSHCRAFT, HUSTLER, KANTRONICS, AEA, VIBROPLEX, HEIL, CALLBOOK, ARRL Publications, and much more. **HAMTRONICS, INC., 4033 Brownsville Road, Trevose PA 19047; (215) 357–1400. FAX (215) 355-8958. Sales Order 1-800-426-2820. Circle Reader Service 379 for more information.**

TEXAS

Dallas

In Dallas since 1960. We feature Kenwood, ICOM, Yaesu, AEA, Butternut, Rohn, amateur publications, and a full line of accessories. Factory authorized Kenwood Service Center. **ELECTRONIC CENTER, INC., 2809 Ross Ave., Dallas TX 75201; (214) 969–1936.**

Houston

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M–F 9–5:30 Sat. 9–5.**GATEWAY ELECTRONICS, 9890 Westpark Drive, Houston TX 77063; (713) 978–6575.**

Southwest Houston

Full line of Equipment and Accessories, in-house service featuring ICOM and YAESU. New equipment on display and operational! **(713) 879-7764; FAX (713) 879-9341. MISSION COMMUNICATIONS, 11903 Alief-Clodine, Suite 500, Houston TX 77082. Circle Reader Service 380 for more information.**

DEALERS: Your company name and message can contain up to 50 words for as little as $420 yearly (prepaid), or $210 for six months (prepaid). No mention of mail-order business please. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '89 issue must be in our hands by February 1st. Mail to *73 Amateur Radio*, Box 278, Forest Road, Hancock, NH 03449.

ADVERTISERS

Issue #351

R.S.#		Page
22	801-SCAN	65
355	Ace Communications	23
1	Advanced Computer Control	75
65	Advanced Electronic Applications	37*
126	Aero Data Systems	83
88	Aerospace Consulting	81
67	Alinco Electronics	51*
•	Allied Appliance & Radio	57
•	Amateur Electronics Supply	21*
89	Antennas West	43
90	Antennas West	71
304	Antennas West	81
302	Antennas West	69
107	Antennas West	60
236	Antennas West	41
5	Antennas West	46
303	Antennas West	67
271	Antique Radio Classified	81
•	Associated Radio	63
16	Astron Corporation	28
•	B & B Instruments	57
53	Barker & Williamson	34
41	Barry Electronics Corp.	27
42	Bilal Company	41
•	Brian Beezley K6STI	60
170	Buckmaster Publishing	87*
7	Buckmaster Publishing	69*
365	Buckmaster Publishing	67
•	Burghardt Amateur Radio	41
•	Butternut Electronics	46
356	C & S Sales Inc.	63
•	Call Sign Cups	81
•	CB City International	87
157	Cleveland Inst. of Elect.	23
186	Coaxial Dynamics	43
343	Commpute Corp.	67
99	Communication Concepts, Inc.	75
121	Communications Electronic	35
10	Communications Specialist	8*
•	Computers,Inc.	67
15	Comtelco	88
12	Connect Systems	1
306	Creative Control Products	64
•	Cubex Company	44
147	Data Com International	63
239	Digital Radio Systems Inc	45
13	Doppler Systems	67*
114	E. H. Yost	36
•	Engineering Consulting	73
268	Etched Call Sign Cups	71
82	Franklin Belle Publishers	53
372	G & G Electronics	69
373	Gap Antenna Products	13
46	Gauthier's Covers Plus	65
•	GGTE	60*
17	GLB Electronics	73
72	Glen Martin Engineering	41
•	Grapevine Group	87
326	GTI Electronics	65
19	Hall Electronics	71
5	Hamtronics, Inc.	11
•	Heath Co.	53
•	Heath Co.	53
110	Horizon Manufacturing	65
269	Hustler, Inc.	42
354	ICOM America	CV2*
•	Intercon Data Systems	64
100	Interconnect Specialists	19
•	International Radio	63
42	Isotron Antenna	41*
272	Jun's Electronics	40
92	K-40	41
•	Kenwood U.S.A. Corp.	CV4,5,6*
2	LEB Enterprises	81
47	Link-Com	71
•	Maggiore Electronics Lab	77
101	Maxcom Inc.	71*
55	Meadowlake Corp.	87
241	Media Mentors	88*
44	Metro Printing	65
86	MFJ Enterprises	16,59
162	Michigan Radio	55
348	Micro Computer Concepts	43
295	Micro Cont Specialities	36
252	Midland Technologies	64
187	Mission Communication & Consulting	87
163	Mobile Mark	69
127	Motron Electronics	43
349	Naval Electronics	73
•	Nemal Electronics	69
•	Omar Electronics	69
•	Orion Business Int'l	83*
96	Orlando Hamcation	58
•	P.C. Electronics	2,71*
152	Pac-Comm	43
178	Pacific Cable Co. Inc.	81
68	Periphex	87
66	Pipo Communications	44
108	Procomm	44
31	Radio Amateur Callbook	75,88
34	Ramsey Electronics	31*
14	Renaissance Development	36
•	RF Enterprises	14
•	RF Enterprises	15
254	Ross Distributing	33
	73	
•	Uncle Wayne's Bookshelf	78,79
93	S-COM Industries	64
332	Satellite City	57*
36	Scrambling News	43
250	Software Systems	44
244	Software Systems	46
•	Somerset Electronics	46
•	Sony Corp. of America	62
51	Spectrum Communications	61
183	Spectrum International	67
•	Summitek	64
11	Surplus Sales Of Nebraska	87
87	TCE Labs	65
28	TD Systems	46
232	TE Systems	77
•	The Ham Center	64
150	The Radio Works	65
115	The RF Connection	65
•	Tropical Hamboree	81
136	Unadilla/Antennas Mfg. Co.	36
•	Universal Amateur Radio	64*
79	Vanguard Labs	57
•	VHF Communications	67
191	W & W Associates	85
38	W9INN Antennas	60
•	Wi-Comm Electronics	65
105	WilBurt Company	88
3	WJB Industries	71
•	Yaesu Electronics Corp.	CV3, 48, 49

* Advertisers who have contributed to the National Industry Advisory Committee (NIAC).

k card

: (614)

KEN-
AMER-
KLM,
NICS,
ARRL
TRON-
evose
5) 355-
Circle
ation.

wood,
, ama-
acces-
ervice
, 2809
969-

, stan-
ustrial
laser
eway's
EWAY
Drive,

es, in-
AESU.
tional!
. MIS-
Alief-
2. Cir-
nation.

tion
ssue

Page
75,88
. . 31*
. . 36
. . 14
. . 15
. . 33

78,79
. . 64
. . 57*
. . 43
. . 44
. . 46
. . 46
. . 62
. . 61
. . 67
. . 64
. . 87
. . 65
. . 46
. . 77
. . 64
. . 65
. . 65
. . 81
. . 36
. . 64*
. . 57
. . 67
. . 85
. . 60
. . 65
. . 88
. . 71
8, 49
he Na-
AC).

AMATEUR RADIO STATION
MSDOS LOGBOOK $24.95
Written by KI6LO

A multi-feature logging application for PC/XT/AT & compatibles. Fast, user friendly operation features on-line HELP key, multiple logs – selectable while in the program. Display beam headings and DX info using a 'HOTKEY' while still logging. Callsign duping during input and very fast data retrieval. Print custom log reports; prefix, country, continent and zone lists; QSLcard labels from data in dBASE 3+ compatible database files. Custom backup feature allows automatic backups and restores of log database files. Complete with 50 page manual (on-disk).

MS-DOS 3.xx with 512k RAM – No coprocessor required. Hard disk recommended. Selectable printer drivers. Uses COLOR or MONOCHROME graphics.

Send $24.95 check or M.O. Add $5 for COD (US & Canada only). CA residents add $1.50. Specify 5.25" (360k) or 3.5" (720k) disk.

LEB Enterprises
(619) 446 – 4355
1127 N. Las Posas
Ridgecrest, CA 93555 USA

CIRCLE 2 ON READER SERVICE CARD

LOGWRITE™

Are you tired of wasting your time and money on sub-par logging programs? Bring your station into the computer age with LOGWRITE, the quality menu driven, user friendly logging program written by Ed Troy (NG3V). LOGWRITE is the perfect accessory for the complete ham station. It simplifies your operation and gives you the competitive edge in contesting and DXing. LOGWRITE works with all IBM PCs and compatibles.

LOGWRITE's unique split screen feature allows for simultaneous logging and text processing. Logging features include:

-Instant callsign or prefix search
-Print, Edit, or View records
-Plenty of room for notes & addresses
-Automatic time/date stamping

Text processor features automatic word wrap, backspace correct, and scrolling. Throw away your pen and paper!

To order your copy of LOGWRITE, complete with instruction manual, send $24.95 (Pa. residents add $1.50 sales tax) to:

Aerospace Consulting
P.O. Box 536, Buckingham, PA 18912
(215) 345-7184
30 day money-back guarantee

(Please specify 3.5 or 5.25 inch floppy.)

CIRCLE 88 ON READER SERVICE CARD

Call Sign Mugs

Your amateur radio call sign on a 10 oz. distinctive, high quality, stoneware coffee mug. Your choice of the ARRL Logo or the QCWA logo on the flip side. Get one for the shack and one for the work place. Mugs are $8.95 each, two for 15.95. Different call signs allowed. Names added $1.00 extra/cup. Price includes S/H for the continental US and APO.

Excellent Gifts or Club Awards!

NC residents add 5% sales tax State logo choice

Call Sign Cups
P.O. Box 17062, Dept. A
Raleigh, NC 27619

★★★★★ PRESENTING ★★★★★
CABLE TV DESCRAMBLERS
★★★★★ STARRING ★★★★★
JERROLD, HAMLIN, OAK
AND OTHER FAMOUS MANUFACTURERS

- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL/WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HOURS

FOR FREE CATALOG ONLY 1-800-345-8927
FOR ALL INFORMATION 1-818-716-5914

PACIFIC CABLE CO., INC.
7325 RESEDA BLVD. DEPT. 183
RESEDA, CA 91335

CIRCLE 178 ON READER SERVICE CARD

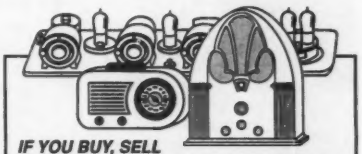
Multiband AntennaPacks

EmergencyPacks contain QRV All Band kink-proof wx-sealed multi-band Dipole-V-Sloper antenna, 70' coax feedline, Quick Launch system, rotproof dacron support braid, 40 p Tech Manual. Complete. Ready for Action. One person installs in 15 minutes. Infopack $1

EmergencyPack
80-10 102' long $99.95
40-10 51' long $89.95
Add $10S & H.

Fastest Antennas in the West
Box 50062-S, Provo, UT 84605
AntennasWest
(801) 373-8425

CIRCLE 90 ON READER SERVICE CARD



IF YOU BUY, SELL OR COLLECT OLD RADIOS, YOU NEED...

ANTIQUE RADIO CLASSIFIED

FREE SAMPLE COPY!

Antique Radio's Largest Monthly Magazine
Articles - Classifieds - Ads for Parts & Services.
Also: Early TV, Ham Equip., Books, Telegraph, Art Deco, 40's & 50's Radios & more...
Free 20-word ad each month. Don't miss out!
6-Month: $11. 1-Year: $20 ($30 by 1st Class)
A.R.C., P.O. Box 802-E5, Carlisle, MA 01741

CIRCLE 271 ON READER SERVICE CARD

Say you saw it in 73!

30th ANNUAL
TROPICAL HAMBOREE
AMATEUR RADIO & COMPUTER SHOW
FEBRUARY 3-4, 1990
YOUTH FAIR EXPO CENTER

• 200+ EXHIBIT BOOTHS • 1,000 INDOOR SWAP TABLES
• 300 CAMPSITES WITH HOOK-UPS • FREE PARKING 15,000 VEHICLES
• PROGRAMS & ACTIVITIES FOR EVERYONE

FRIDAY SPECIAL!!!
ATTORNEY C.L.E. SEMINAR
Conducted by ARRL Legal Strategy Committee

Registration: $5.00 Advance – $6.00 Door. Valid Both Days (Advance deadline Jan. 26)
Swap Tables: $20.00 each + Registration. Power: $10.00 per User
Campsites: 3 Days (Fri., Sat., Sun.) $40.00 (Thurs. by Special Arrangement)
Headquarters Hotel: Miami Airport Hilton – $78.00 Single, Double
Alternate Hotel: Airport Lakes Holiday Inn – $55.00 Single, Double

WRITE TODAY
FOR DETAILED BROCHURE
& RESERVATION FORMS

Send to: Chairman, Evelyn Gauzens, W4WYR
2780 N.W. 3rd St., Miami, FL 33125
Tel.: (305) 642-4139

Never Say Die

continued from p. 4

WA3YQY, Carlos Opus I, the Scourge of Eddyville (NY), has cleaned his area of jammers, breaker-breakers, tail-enders, and long-winded wimp old-timers with nothing whatever of interest to talk about.

living in caves, came up with a wonderful no-code license several years ago. It's incredibly like the ARRL proposal. It also has attracted less than 100 takers so far. Talk about a bomb. We couldn't pick a worse model to emulate if we had even the slightest interest in actually solving our problem. No, this debacle had to be planned—it's too dumb to be an accident.

Three Steps to Winning

Yes, I believe amateur radio can be saved. I believe it's possible for us to (1) clean up our bands so any thinking newcomer will not compare us unfavorably with CB; (2) actually have many interesting conversations over the air, not only locally, but even internationally; (3) attract youngsters to our hobby on the basis that it's fun.

It doesn't take much listening to discover that we have some serious people problems in our bands. Hams like K1MAN need to have the concept of others' rights explained to them. KV4FZ needs to understand the ramifications of his actions and how severely he is damaging our hobby. I singled those two out because I have a stack of recent complaints about them. There are hundreds of hams who are lousing up our nets, repeaters, traffic handling and so on. Many of these are not going to be easily convinced to stop messing up our bands. Many are going to be major challenges to our ingenuity since they seem to be all mouth and no ears.

We need some sort of Band Police system. Unfortunately, all too often the police become as much a part of the problem as the solution. We have only to watch the police in Chile beating people to death—the army/police in Israel shooting children—the army/police in China shooting thousands of children—the death squads in Central and South America "disappearing" thousands of troublesome people—to see where police action can go wrong.

What about our "police," the FCC? Every few days I get copies of complaints filed with the FCC citing well-documented intentional ham interference cases. Some groups, frustrated by the FCC disinterest, have started peppering their congressmen with complaints. Unfortunately, these complaints are far more destructive to the future of amateur radio than the perverse actions which are causing them. Bureaucrats tend to shoot the whistleblowers—kill the messenger.

Well, if I'm not suggesting our forming vigilante parties to string 'em up, nor our turning to what we perceive as our authorities for help, where can we turn? We do have an almost completely unused strength—a powerful strength. If we use this strength, I believe we can clean up our bands in a surprisingly short time. This strength lies in our thousands of ham clubs. It lies in our working cooperatively to clean up the mess. Remember, we outnumber the bad guys a hundred to one—if we cooperate.

By organizing our defense against the garbage on our bands—against the ham terrorists who are ruining amateur radio for the rest of us—we can, if we work smart, get them to cooperate.

This starts at home. At the next club meeting, form a garbage cleanup committee whose purpose is to tackle local repeater problems. The committee will be looking for jammers, offensive language and other inconsiderate activities. Getting the hams who are making the mess to clean up their act requires both tact and firmness. If you come on as officious and unreasonable, you'll stir up a worse hornets' nest.

When I'm in the middle of a QSO on a repeater, breaking back and forth, I get as irritated as anyone else when someone comes on and lectures me about the FCC regulations on identifying. If he broke in and asked for my call, I'd have no problem. Few people are comfortable with being told what to do, but most of us will go that extra mile if we're asked.

If someone uses bad language, why not break in and ask him to please be careful, that your granddaughter or friends are listening? That may get more cooperation than your reading him the regulation against bad language, which can easily turn the frequency blue for quite some time.

Hunting jammers is real fun. It'll give your club some first rate direction finding experience. You can do fine with cars, but if you have a member with a plane you'll be able to home in on jammers in minutes. I remember a Massachusetts club which had a persistent jammer. DFers discovered it to be none other than the club president trying to force unwanted hams off "his" repeater! Hi, Bob.

By working in club groups and reporting repeat offenders at meetings, you'll have strength. If you find some local hams who can't be helped to improve their ways, it's time for stronger measures. This is where you need to be creative. For instance, you might consider a whole-club visit some evening to his house. Fifty or so hams knocking on the door might make an impression on even the most sour type of ham.

Now and then I get nasty letters about my editorials. I welcome ideas and facts, but not nastiness. When I get letters like that I feel sorry for the ham's family—they have to live with him every day. No nice person suddenly is nasty in a letter—that takes someone with mental problems. It's just the same on the air.

We do have some serious sickos in our hobby. Contrary to the popular myth, the code test has been a total failure in keeping out undesirables. I'm not yet completely convinced that it's the code which makes hams crazy, but I have noticed an otherwise unexplainable correlation between class of license and the number of loose marbles rattling around in many heads.

Once your club garbage cleanup committee has had success on your local repeaters, it's time to tackle low band crazies. First look for nearby hams who are screwing up, and apply your now well-developed group reasoning powers. If you hear more distant ops messing things up, try reason first. If that fails, see about getting help in their area. I'd love to list the clubs in *73* which have formed garbage cleanup squads so you'll be able to get help when you run into persistent spoilers. Their local clubs may have more success getting through to them.

The idea is to be polite but firm. You want to get their cooperation, not get them so mad they'll jam your net until they die. If we manage to make the papers with our efforts, I'd prefer it be for picketing his home rather than fire-bombing his car.

Can We Finally End Pileups?

Pileups are caused by poor DX operating. We need to educate DXpedition ops and ops in rare countries on how to avoid pileups. Pileups are like a shark-feeding frenzy—they get started by a DX op and then get out of hand, with the DX-chasers losing all perspective and reason.

How can a DX op with a weak signal keep pileups from happening? It's easy. I've DXpeditioned from many rare countries and I've learned how to keep the pileups from happening. To brag just a bit (as usual), I've operated from KP1, 3D2, 3D6, 7P8, 7Ø, 5W4, 5Z4, KS6, KW6, KG6, KR6, 9M6, 9M8, 9N1, YK1, OD5, HS, YA, EP, FO8, FK8, VU, HL, VS6, 9V1, JY, OHØ, FP8, etc., so I'm not without some experience at this.

My operating system, once I hear the beginnings of a pileup, is to explain my rules and go by them rigidly. I explain that I'm going to stand by for about 30 seconds and write down just the last letter of any calls. I don't want anyone to send anything but the last letter of their call—one letter. I suggest they not all transmit immediately, but wait and space out their calls—with no more than two transmissions of their last letter.

I then break in and ask each letter I've heard to stand by while I list everyone calling. I keep this up until the frequency is silent. Then I ask each letter I've heard to give their call once and nothing more. I confirm the call, give the report and ask for my report, with absolutely no breakers. I then confirm my report, and without missing a beat, ask for the next letter's full call only. Once I've worked all the letters I've listed, I give my QSL information, explain the rules again and stand by to list more

letters. In this way I'm able to get right down to the QRP, weak DX and mobile stations with no pile-ups, no DX crush and no panicky DXers wondering how soon the band will change. I don't even need a strong signal to make it work.

When someone with poor operating manners insists on botching things up, I explain that if he keeps it up, no QSL.

We can cure all our miseries if we cooperate and persist.

Making Contacts More Interesting

Though I've written about this before, I haven't yet noticed any signs that anyone has been paying attention. Yes, it's difficult to make contact with someone you've never talked with before and try to develop interesting conversations. It's easier to mindlessly babble about your rig, antenna and weather, none of which is of any more interest to him than is his station to you.

The up side of our having very few young hams is that most of you can read. The question arises, if you *can* read, *are* you actually reading? Let's be rotten about this—when is the last time you read a book? Any kind of book? I'm having some interesting non-ham books included in the Uncle Wayne's Bookshop, just in case you want to give reading a try.

I look at it this way. If an old coot like me can publish *73*, put out a major music magazine (*CD Review*), and a handful of other smaller publications, run a record company, a mail order music company, etc., and also manage to read a big stack of magazines plus a couple books a month, why can't you? I'm not superhuman, I just spend my time carefully.

I also watch TV, see most of the better movies, get to concerts, go on skiing and diving trips, get to business conferences and ham-fests, but that doesn't keep me from reading. So, when you contact me on the air—and yes, I even get on the air—I'll be delighted to talk with you about almost anything. If I know about it, fine. If I don't, I want to.

I can't remember anyone ever asking me what I've read recently. I often ask. I can't remember anyone in the last 50 years asking me first what I do.

You know, if you just started asking the chaps you talk with what restaurants in their area they recommend and why, you'd soon have the makings of a restaurant guide book.

Maybe they know some well-known people? Have you ever asked 'em? No one has ever asked me—and I've known a few. I also have some great stories I can tell about 'em. Ask me about Amelia Earhart, about aviation pioneer Frank Hawkes, Steve Jobs, King Hussein.

One way to help us get more interesting contacts is to have nets set up for discussing specific interests. Special Interest Group Nets (SIGNs). I occasionally call into the submariners net, the ex-GE employees net and the Mensa net. If there were nets devoted to cosmology, UFOs, new ham technologies, Gaia, the greenhouse problem, educational technologies, etc., I'd be on the air much more.

If you've got a good signal and are willing to sponsor a net, find a frequency and time which won't get others all upset and get it started. Let me know the time/day/frequency and I'll publish it in *73* so you'll have the whole country from which to draw.

The slow scanners should have a net frequency—not for sending pictures, but for discussing new circuits, new equipment and late developments. OSCAR ops have such a net. Every ham special interest should organize nets as meeting places. I remember running into a doctor net, airport manager net, ham flyer net, Westinghouse employees net—so where are the skier and skin diver nets?

Talk to me about books, music, places you've traveled, your other hobbies—talk to me! But please don't tell me what rig you bought or what antenna you've got up there. Please! I don't really even want to know my signal report—more than you're hearing me fine or, more probably, with some difficulty. I hate getting a 5-9 and then finding that about 2% of my transmissions have actually been heard. I also hate finding that the only reason someone has called me is because they "need New Hampshire." For what?

I have this strange concept of amateur radio—that it's best used for communications. I'm not sure what the driving force is behind someone having to work every country in the world. I could see wanting to *talk* with every country, but ten-second contacts just to get QSL cards? That's crazy!

Okay, okay, I know I just got through explaining how to make fast, stupid contacts. Well, I can't change the world in a day. And,

THE ORION ROTATOR!
OR-2300
• 35 Square Feet
• Made In U.S.A.
• Proven Worm Gear Drive
• Fits Most Towers
• Stainless Steel Hardware
• Self-Centering Mast Guide
• Variable Speed
• Standard Hole Pattern
• 1 Year Warranty
• Pre-Set Option
For further details contact your local dealer or Orion.

ORION BUSINESS INTERNATIONAL, INC.™

P.O. Box 9577
Canoga Park, CA 91309
Tel: (818) 888-4927
Fax: (818) 888-5112
Telex: 697-4899

$4.50 PER DISK 1-9 $3.75 PER DISK 10 OR MORE

HAM SOFTWARE

PUBLIC DOMAIN AND SHAREWARE FOR COMPUTERS

IBM PACKET BBSs

PACKET TERMINALS

IBM MISCELLANEOUS

NETWORKING

RTTY/FAX/CW/SSTV

ELECTRONICS

AMIGA

C-64

MORE PROGRAMS FOR THE AMIGA IN OUR CATALOG

MORE PROGRAMS FOR THE C-64 IN OUR CATALOG

AERO DATA SYSTEMS

PO BOX 9325
LIVONIA, MI 48151
(313) 471-1787

MasterCard VISA

Please enclose $2.00 shipping and handling on orders under $10.00

CIRCLE 126 ON READER SERVICE CARD

yes, I even encourage this sort of madness with my DX Dynasty award. You can't imagine how much I hate myself for that. Talk about being my own worst enemy! But when I saw the blundering mess DXCC has become, it just seemed to me that, no matter how dumb the premise, someone ought to do it better. So I started the DX Dynasty, which has 400 countries—all legitimate countries. That's how many the official IARU member societies accept as countries—and who knows better what is or is not a country than the IARU official amateur radio societies? This keeps me out of the country decision hassle and all those weird rationalizations which have hamstrung (sorry) the ARRL.

Thus, on the one hand I have an award available for hams who are unable to prevent themselves from being stupid—and on the other I'm saying don't ruin our hobby by going for these operating awards. You're going to have enough to answer for when you get your "silent key" award without having to find out how much you've aggravated hundreds of hams with your 10 kilowatt rock crusher when they replay "this was your life." If you'd read some books, you'd know what I'm talking about.

Step Three

Let's fantasize that we've reconditioned the jammers and made them honored members of our ham society. That's step one. Next we've managed to get a reasonable number of hams to actually talk about interesting things on the air. Step two. That still leaves step three, getting newcomers. At least by now we'll have a hobby of which we can be proud—something we can feel good about to sell. By the time we get to step three, it'll be easy to attract new hams. When we're ready we can tackle this hurdle. We're not ready yet.

Now, The Clubs

While there is no doubt in my mind that there are some really progressive ham clubs hidden around the country, the sad fact is that a high percentage are disasters. I mentioned addressing one recently where I was one of the youngest people present.

I wish I had the space in *73* to publish the endless letters I get from younger hams telling me about their terrible experiences in trying to get help from a local ham club. Maybe I can get these onto the *73* BBS so you can see some of the mail I get and perhaps develop a better understanding of our root problems.

I pointed out that the FCC should not be perceived as a strength upon which we can lean. I don't think they hate amateur radio, they just don't want to be bothered. Amateur radio has been a royal pain in the butt for them for years, with little on the up side.

Well then, we certainly can depend on the ARRL, right? Trying to discuss the ARRL evenhandledly is about as fruitful as trying to discuss agnosticism at a Baptist revival meeting, so I'll leave you with your beliefs and not upset you with facts. I will say that it is my considered opinion that any belief that the ARRL is going to be helpful in solving our problems is more fantasy than reality.

Okay, if we can't depend on the FCC or the ARRL to save us, certainly the ham industry, which is totally dependent on ham sales, will do it, right? Wrong.

The only strength we really have to work with is our ham clubs. We do have a few of these which are being intelligently guided—which are going all out to attract youngsters to our hobby—which are taking an interest in trying to rebuild our hobby. Alas, we have an awful lot of clubs, run by old men, which are doing all they can to keep kids out.

What I suggest you do is this: Take the time and interest to find out when your local ham clubs meet. Go to the meetings. See how they are running. Are the meetings interesting or are they dominated with "business" discussions which make them dreadful bores? Do they have exciting speakers?

Speakers. Let me discuss speakers. You'll be able to get some really interesting speakers if you try. But if you treat them the way I've been treated they'll quickly stop addressing ham clubs.

When you are able to attract a good speaker make sure that you do something special about it. Get notices in the newspapers and on local radio stations to attract an audience. Talk it up with announcements on local repeaters.

Have a pre-meeting dinner to get the speaker together with a few selected interesting club members. This will help the speaker know what the audience will be most interested in hearing about.

At the meeting immediately introduce the speaker and let the speaking commence. No "short" business meeting. No yearly elections. If you absolutely can't prevent yourself from these destructive activities, at least leave them for after the speaker has gone.

Give the speaker plenty of time to talk and answer questions. Then have the coffee & doughnuts, with a further informal talk session. Thank the speaker and give him or her some memento of the occasion.

A good friend of mine, a top ham speaker, won't talk to a club unless he gets $1,000 up front. It isn't that he needs the money, it's just that this is what he found it takes before a club will take him seriously enough to pay him some respect. I tried that and, sure enough, I found I got a lot more respect when I charged $1,000 than when I speak for free.

I remember being invited to address a ham club near Boston. They neglected to tell me how to find the meeting place—just check in on the repeater for directions. So I drove to the town and called in. No one on the repeater knew where the meeting was. I persisted and finally someone came on who was able to give me directions. When I got to the meeting, they were busy with Field Day preparations, so it was after 10 p.m., when everyone was tired and ready to go home, before there was time for me to talk. No, I don't speak to many clubs these days.

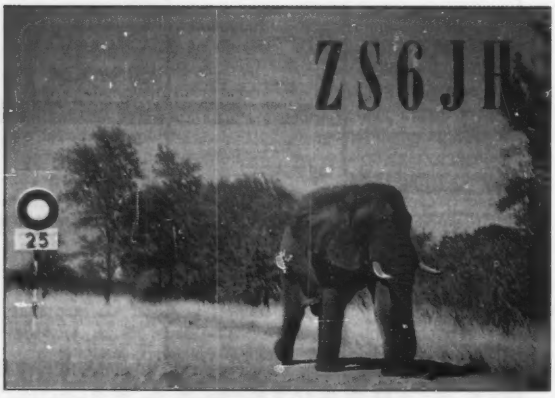
If you take the time to infiltrate your local clubs you'll be in a position to improve the meetings. Anyone who speaks up at club meetings is quickly made the club president. Get yourself in a position to make sure the club goes after youngsters and then gets 'em licensed. Make sure the meetings are fun for everyone. Get a garbage committee going to help clean up our bands. Club meetings are show biz, so they have to be planned.

Plan B

Let's indulge in the unlikely fantasy that my plan for you to get your local ham club to form a Garbage Committee to clean up our bands has fallen on the usual deaf ears. The "little old ladies" who are running the club don't think the club should "get involved" with anything as controversial as that.

I go out on a limb every month for you in my editorials and what do I get in return? I get timid, pukey, mewling letters saying yes, golly, I sure agree with you, but for heaven's sake, whatever you do, don't print my name or call. Spineless, wishy-washy, gutless namby-pambies. That isn't the spirit that made America great, that's the spirit that has helped us collapse into last place in the developed world in education and to lose our electronics industries to Japan.

Of course, if you don't read anything but ham magazines, and are thus a certified ignoramus, I can understand why you're terrified of expressing an opinion. I can also see why you might go into a quaking panic at the idea that the ARRL might sense some slight defection on your part. Some hams seem fearful that if even a hint that they are not absolutely delighted with every aspect of The



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock NH 03449, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

League is detected, the local SCMs and their dreaded right wing "death squads" will kidnap and torture them.

Now, while this may possibly be happening in some isolated areas where there are overly zealous SCMs, I don't see where this can honestly be a serious concern for most hams.

But, if you're too much of a milquetoast to go on the air and help bring reason and order to our ham bands using your own call—if you find youself going into a blue funk at the mere thought of standing up for what you know darned well is right—I have a solution. I have a way for you to be daring—for you to tell off (sort of) the cretins who are lousing up our bands without ever letting them know who you are. I have a way you can blame the whole thing on me. So, even if you are a lilly-livered, yellow-bellied, sasparilla-drinking coward, you'll still be able to lend a hand in cleaning up the mess on our bands you've allowed to grow into a monster. It's time to stop turning the other cheek. It's time for you to take a stand, no matter how weak.

Okay, here's a way we can work it. As you know, when you operate my station, you're permitted to use my call as long as I have "control," right? You can only sign my W2NSD call letters within the limitations of your license or mine, so if you've an Extra Class license you can only operate in the Advanced Class bands. If you're a Tech, you can only operate in the Tech bands, even using my call.

Now here's what you do. When you hear someone making a mess of things on the air, break in and say, "Please...please...give me a break!...this is W2NSD." If you say exactly that, as I've asked, then obviously *I* am in control of your station. If you say anything else, you're in control and you'll have to use your own call.

One voice in the wilderness asking some idiot who has been using bad language or jamming a net or a repeater to shape up won't get much heed, but if every *73* reader makes it his or her business to spend even ten minutes a day helping to clean up our bands, us good guys will be able to rout the baddies. A chap who misuses our bands may not pay any attention to one bleat of indignation, but if fifty voices, all claiming to be W2NSD, get after him, perhaps the message will eventually get across.

"Talk to me about books, music, places you've traveled, your other hobbies—talk to me! But please don't tell me what rig you bought or what antenna you've got up there."

Notice that I've asked you to say "please." You're asking him to shape up, not telling him. It's much more difficult to ignore someone asking you than someone ordering you to do something. When I'm in control of your station be sure you don't jam or make more of a mess of things.

The normal reaction by the bullies who are messing up our bands is to launch into a long insulting diatribe. This is designed to make you mad and retaliate. This is what it's all about for this brain-damaged would-be CBer. I've found the best way to handle this is to immediately tune off the frequency when the hate starts and look up the band for other mental retards to discourage.

Of course, if you have a clean-up group working with you via a repeater, you can drive the bully nuts with different voices asking him to "give me a break...this is W2NSD."

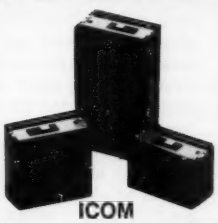
Let me know how this works out for you. If we don't have success with Plan A or Plan B, we may have to go to Plan C, which involves Dick Bash—remember him? I've heard he's now selling AK-47s. Nothing changes.

If you're panicky that I might print your call in *73*, don't let that stop you from writing; just let me know and I'll keep it secret—although we are talking about starting a ham whistleblower relocation program. I expect to get some interesting stories of your

BATTERIES "R" US...

You've bought our replacement batteries before...

NOW YOU CAN BUY DIRECT FROM US, THE MANUFACTURER!



ICOM

CM2, PB2 7.2v @ 500 MAH

CM5, PB5 10.8v @ 500 MAH

SUPER

7S 13.2v @ 1200 MAH $63.95

8S 9.6v @ 1200 MAH $59.95

(base charge only–1" longer)

ICOM CHARGERS AVAILABLE SOON

HAPPY HOLIDAYS

SEASON'S GREETINGS

12% OFF ON ALL PRODUCTS FOR

THE MONTH OF DECEMBER!!!

CUSTOM MADE BATTERY PACK & INSERTS

Made to your specifications.

KENWOOD INSERTS

PB-21—$13.75, PB-25—$20.00

PB-28—$20.00

ICOM INSERTS

BP-5—$23.00, BP-3— $17.45,

BP-7, BP-8

Prices subject to change without notice.

MasterCard and Visa cards accepted. NYS residents add 8¼% sales tax. Add $3.00 for postage and handling.

SOURCE FOR ALL YOUR COMMUNICATION BATTERY REPLACEMENT NEEDS.

W & W ASSOCIATES

29-11 Parsons Boulevard, Flushing, N.Y. 11354

WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE.

In U.S. & Canada Call Toll Free (800) 221-0732 • IN NYS (718) 961-2103 • Telex 61060 16795 • FAX: (718) 461-1972

MADE IN THE U.S.A.

SEND FOR FREE CATALOG AND PRICE LIST

CIRCLE 191 ON READER SERVICE CARD

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson AZ 85541

December Forecast

December days are the shortest of the year, so expect the higher frequency HF bands, 20–10m, to close at dark or late afternoon. Occasionally, on very good days, you will find them open long after dark.

Solar activity is higher than it has been in 10 years, and you can expect some sudden ionospheric disturbances brought on by solar flares and other events on Old Sol. As shown in the daily forecast calendar, on days with a P, F or G, expect Poor, Fair, or Good conditions, respectively. Allow for an error of a day or two in either direction.

Reading the Chart

When a given band is open to a place on Earth at a specific time as indicated on the chart, look a bit earlier, just for fun. On some days, these openings may not exist at all, so try a lower band. In many cases, you'll be pleasantly surprised to find the next higher band open as well. For the WARC bands, you'll find propagation sharing some of the characteristics of the next higher and next lower adjacent ham bands.

An * means to try the next higher band. (1) means an opening may be rare, but possible on "good" days (G). When 20/40m or 40/80m are indicated, both bands are likely to be open at the same time to the same location.

DXing

Grayline propagation, at dawn or dusk along the path of the terminator, may be especially good on all bands from 40 through 10. Keep an ear tuned to WWV at 18 minutes past the hour for current propagation conditions.

Good DX! 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	—	—	—	—	20	20	15	15	—	—	15
ARGENTINA	15	15	15	20/40	20/40	—	—	—	—	—	10	10
AUSTRALIA	15	15	—	—	20	20/40	20	20	—	—	—	—
CANAL ZONE	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
ENGLAND	40	40	20/40	20/40	20/40	—	—	10	10	15	20	40
HAWAII	15	15	20	—	40	—	—	—	—	—	—	15
INDIA	15	20	—	—	20	—	—	—	—	—	—	—
JAPAN	15	—	—	—	—	20	20	15	15	—	—	15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20*	—	—	—	—	—	15	—	—	15	15*	—
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
SOUTH AFRICA	—	40	—	20	20	—	—	15	15	15	—	—
U.S.S.R.	—	—	—	—	—	—	20	15	20	20	—	—
WEST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

CENTRAL UNITED STATES TO:

ALASKA	15	15	—	—	—	40	20	20	20	—	—	—
ARGENTINA	10	15	20/40	20/40	—	—	—	—	—	—	15	10
AUSTRALIA	15	15	15	20	20/40	20/40	20	20	—	—	15	—
CANAL ZONE	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND	—	—	—	—	—	—	20	15	10	15	20	—
HAWAII	15	15	15	20	20/40	20/40	—	—	20	—	—	15
INDIA	15	20*	20	20*	—	—	—	—	—	—	—	—
JAPAN	15	15	—	—	—	40	20	20	20	—	—	—
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
PHILIPPINES	15	—	20	20*	—	—	—	20	20	15	—	—
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
SOUTH AFRICA	—	—	40	20	—	—	—	—	15	20	—	—
U.S.S.R.	—	—	—	—	—	—	—	—	—	20	20	—

WESTERN UNITED STATES TO:

ALASKA	15	—	—	20	20	20	20/40	—	20	15	—	15
ARGENTINA	10	15	15	15	20	—	20	20	—	—	—	10
AUSTRALIA	10	10	15	15	20	20	20/40	20	20	—	—	—
CANAL ZONE	15	15	20/40	20/40	20/40	20	—	15	—	—	10	10
ENGLAND	—	—	—	—	—	—	—	—	20	15	20	—
HAWAII	10	15	15	20	20/40	40/80	20	20	—	—	15	10
INDIA	—	—	15	—	—	—	—	20	—	15	—	—
JAPAN	15	—	—	20	20	20	20/40	—	20	15	—	15
MEXICO	15	15	20/40	20/40	20/40	20/40	20	—	15	—	—	10	10
PHILIPPINES	—	—	—	—	—	20	20	20	20*	15	15	—	—
PUERTO RICO	15	15	20/40	20/40	20/40	20/40	20	—	15	—	—	10	10
SOUTH AFRICA	—	—	—	20	20	—	—	—	—	20	15	—	—
U.S.S.R.	—	—	—	—	—	—	—	—	20	20*	20	—	—
EAST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

DECEMBER 1989

SUN	MON	TUE	WED	THU	FRI	SAT
					1 G	2 G
3 G	4 F	5 F	6 F-G	7 G	8 G	9 G
10 F	11 F-G	12 G	13 G	14 G	15 G	16 G-F
17 F	18 F-P	19 F-P	20 P	21 P	22 P	23 P
24 P	25 P	26 P-F	27 F	28 F-G	29 G	30 G-F
31 G-F						

Never Say Die

successes—and your failures.

The only way we're ever going to clean up our bands is with your help.

Perhaps you noticed that when you use my call you're going to be nice, not mean. We have more meanness than we need on our bands right now, so kill these rotten scoundrels with niceness. These guys are experts at getting your goat. You'll absolutely ruin their day if you are unflappable.

This shouldn't stop you from pittying their family and friends, who have to put up with them during the few hours a day when they are not spoiling our bands for us.

Plan B, Part II

If you find it heavy going when you try to inject some intelligence into your contacts, I have a shortcut for you. Mark you, this is probably going to be one of the most difficult things you've ever done in amateur radio—worse even than that stupid 1920's code requirement which drove you bananas when you decided to get your ticket.

I'm asking you right here and now to take a pledge—to sign an oath—make a pact with me. I want you to go to your hamshack right now, draw a line under the last contact in your log and write this:

"I hereby swear that never again, as long as I live, will I ever divulge over the air the manufacturer, model number or any other information about any equipment I'm presently using, plan to use in the future or have used in the past. Further, that includes every aspect of my antenna system, homemade or bought. I also agree that I will not, under any circumstances, discuss today's weather, either here or anywhere else in the world, in anything less than a declared national emergency." Now sign that pledge and start your first day as an evangelical spreader of the gospel of Better Hamming. If anyone pressures you to break your pledged word, just tell 'em you've signed the "W2NSD pledge" and that wild horses, Wouff Hongs or even Rettysnitches (infamous old ham ARRL torture instruments used to beat "rotten QRMers" into either compliance or silent keys) will not change your firm principles.

Would you like to really drive some thoroughly rutted hams absolutely crazy? Have you ever tried *not* giving them a numbered signal report? You see, there's this column in their log for a signal report. "Armchair copy" or "You're coming in pretty good" isn't there. They need a number. I've had some hams plead, reduced to tears, for their signal report.

You've never seen a tougher sonofagun than me. I tell 'em, if they absolutely must put a signal report in their log, why go ahead and make one up. No, they've got to hear it from me, otherwise it's cheating. I smile a wicked, fiendish smile as I taunt them almost beyond endurance. Nothing will force me to give them that treasured number. Yes, I realize that I may occasionally push some Extra Class hams over the edge. They deserve it.

"Hunting jammers is real fun. It'll give your club some first rate direction finding experience."

I had a letter from an W4's XYL saying her husband has been unable to make another contact. The unfiled box in his log had brought him to a sudden halt in his hamming, so he'd started helping her with the housework and please, please send him his report so she could get him back into the hamshack and out from under foot.

Figuring that I'd done hamdom a big favor and that it was better for his wife to suffer than hundreds of hams, I refused. I knew I'd get no thanks from any of you for this public service, but it was still worth it.

So go you forth and do likewise. Don't expect any thanks. All you'll get for your trouble is abuse, but when you finally win that last big honor, your ARRL Silent Key Award (many hams are dying to get it), then's when you'll get your reward. If I'm not there already, have patience, I'll be along and pin an ectoplasmic medal on your sheet. Then we'll go down on 20m, call CQDX, sign very rare calls with weak signals and not come back to the DXers. 73

AMIGA commodore
CHIPS—PARTS—UPGRADES

6526	$12.25	8362 (DENISE)	$56.95
6567	$15.95	8364 (PAULA)	$56.95
6510	$10.95	8386 (GARY/5719)	$17.25
6581	$11.50	8520-A1	$17.95
PLA	$11.95	8372 (NEW AGNUS)	$109.95
All 901 ROMS	$10.95	8562	$22.50
		68881-RC16	$79.95
		68882-RC12	$72.50
		68882-RC16	$105.00
		68020-RC16 (16 MHz)	$74.95
		1.3 KICKSTART ROM	$27.95

NEW 1MB AMIGA FATTER AGNUS CHIP $109.95

C64 Hvy Duty PWR/S .. $24.95

Commodore Diagnostician II — $6.95
Just Released

Saves you money on REPAIRS & DOWNTIME by promptly locating faulty IC chip(s) on all COMMODORE computers and 1541 drives. Different sections contain "cross referencing" of chips and "block layout." (A schematic is included but not needed.) Over 12,000 "DIAGNOSTICIANS" sold worldwide . . . See fantastic full page review in March 88 "Computer Shopper Magazine." Price is $6.95 prepaid in the U.S.

PREPAID TO NO. AMERICA

Send for our FREE catalog.

The GRAPEVINE GROUP Inc.
35 CHARLOTTE DRIVE
WESLEY HILLS, N.Y. 10977
FAX 914-354-6696 914-354-4448 800-292-7445

Dealer Prices available.
Prices subject to change.

MAKE CIRCUIT BOARDS THE NEW, EASY WAY

WITH TEC-200 FILM

JUST 3 EASY STEPS:

- Copy circuit pattern on TEC-200 film using any plain paper copier
- Iron film on to copper clad board
- Peel off film and etch

convenient 8½ x 11 size
With Complete Instructions

SATISFACTION GUARANTEED
5 Sheets for $3.95 10 Sheets only $5.95
add $1.25 postage NY Res. add sales tax

The MEADOWLAKE Corp.
Dept. A, P.O. Box 497
Northport, New York 11768

CIRCLE 55 ON READER SERVICE CARD

MISSION CONSULTING, INC.
MISSION COMMUNICATIONS
11903 Alief-Clodine Suite 500
HOUSTON, TEXAS 77082

WE HAVE EXPANDED AND NOW STOCK MANY NEW PRODUCTS. WE CARRY:
AEA, ALINCO, AMECO, AMP SUPPLY, APHA DELTA, ANTECO, ARRL, B&B INSTRUMENTS, BARKER & WILLIAMSON, BENCHER, BOMAR, BUTTERNUT, BEE, CUSHCRAFT, COMMUNICATION SPECIALISTS, CRB RESEARCH, DAIWA, DIAMOND, HENRY, HUSTLER, HAM RADIO, INTL. CRYSTAL, INTL. WIRING & CABLE, KANTRONICS, KACHINA, KENPRO, KDK, KLM/MIRAGE, LUNAR, LARSON, MOBILE MARK, MFJ, NEUTECH, NCG, NYE, PERIPHEX, QST, RF INDUSTRIES, RADIO PUBLICATIONS, RADIO AM. CALLBOOK, SAMSON, SPI-RO, SMILEY ANTENNA, SANTEC, SYN. TEXTILES, 73MAG, STANDARD, TAD, TEN-TEC, VALOR, VECTOR, GORDON WEST, WELZ, YAESU, AND ICOM. **(713) 879-7764**
In house service available. **Telex 166872 MCON UT**
Just write, or give us a call! **FAX (713) 879-9341**

CIRCLE 187 ON READER SERVICE CARD

CB-TO-10 METERS

We specialize in CB radio modification plans and hardware. Frequency and FM conversion kits, repair books, plans, high-performance accessories. Thousands of satisfied customer since 1976! Catalog $2.

CBC INTERNATIONAL
LOU FRANKLIN/K6NHE Owner
P.O. BOX 31500X, PHOENIX, AZ 85046

NEW ONLINE CALL DIRECTORY

Our new *HAMCALL* service gives you 494,114+ Hams, via your computer. $29.95 per year — unlimited use!

BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703: 894-5777 800: 282-5628

CIRCLE 170 ON READER SERVICE CARD

DOORKNOB CAPS

SERIES 57 • 15 KV	
25 pf	$33 or 4/ $125
40 pf	$29 or 4/ $110
100 pf	$33 or 4/ $125
200 pf	$29 or 4/ $110
500 pf	$29 or 4/ $110
1000pf	$29 or 4/ $110
1500pf	$33 or 4/ $125

SERIES 58 • 5 KV $11ea or 4/ $40	
10 pf	63 pf
12 pf	80 pf
20 pf	85 pf
25 pf	100 pf
28 pf	110 pf
30 pf	120 pf
40 pf	140 pf
47 pf	200 pf
50 pf	500 pf
57 pf	1000 pf

ARCO SOLAR CLOSE-OUT SALE
Arco Solar M65, 42watt, 14.6v $399
Arco Solar M25, 22watt, 14.6v $210
Arco Solar G50, 2.5watt, 14.6v $57
Arco Solar G25, 1watt, 14.6v $45
Mini-Circuits TFM-2-408 Mixers $10
BIRD 4E100 Power Sensor (400-1000MHZ – 25/100 WATTS $75
Belden RG/174 50Ω coax 25¢/$ 4
Kilovac HC-1 Vacuum Relay $109
Jennings RD5B Vacuum Relay $75
Chimney fits 3-500Z / 4-400A $45
Heat Dissip. Plate Caps 3-500Z $15
Hy-gain #155 Center Insulator $10
Copperweld 14ga Stranded Mil Spec 50' - $7 • 150' - $16 • 300' - $29

COLLINS EQUIPMENT ON HAND
51J-5, 75A-4, KWS-1, 32S-1, 32S-3, 75S-1, 75S-2, 75S-3C,KWM-2/A, 30L-1, 399C-1, 312B-4, 302C-3, KWM/HF-380

Store Owned & operated by Bob Grinnell, WD0FDF

THANKS FOR LOOKING !

PIN DIODES FOR "RF" SWITCHING

BA282	VHF/UHF Switcher .5Ω	dc -0.5 GHz	10/$ 3.50
HP3168	VHF/UHF Switcher .5Ω	dc -0.5 GHz	10/$ 3.50
HP1N5767	VHF/UHF Switcher	$1.25ea	10/$11.00
UM9651	400watt RF Switch .16Ω	1 - 30 MHz	5/$15.00
UM9137	400watt RF Switch .5Ω	dc -0.8 GHz	5/$12.00
UM7104	800watt RF Switch .6Ω	dc -5.0 GHz	$10.00
HP1N5711	Schottky Barrier for UHF Mixers		10/$11.00
HP2693	HOT CARRIER DIODE		10/$ 5.00

UTO519(new version) **AVANTEK** 5-500MHz Cascadable RF amp $49

ROCKWELL COLLINS

USE ORIGINAL PARTS. DON'T SUBSTITUTE

- **PANEL METERS** *(new)* for most Collins' gear. YOUR CHOICE $85
- **MANUALS**, Brand new!! KWM2/A, 30S-1, 30L-1– $45; 75S3B/C, 75S-1, 32S-3 –$40; 75S-3/A, 32S-1– $35; 180S-1, 516F-2–$15; 312B-4/5– $30; 51S-1–$65; 32V-3–$95; HF-380 (service)– $195, (operations)–$20
- **Paint, SPECIAL** #126, 180, 250 or 270 shade of gray.16oz spray can $12
- **Crystals:** All frequencies in stock $8each, 5 or more crystals only $ 7
- KWM-2A plug-in relays 970-2439-010(X96) or 970-2439-020(X97) $49.95
- **KWM-2A RELAY** Modification kit converts open frame to plug-ins $129
- TR relay for KWM-2, 32S or 30L-1 , Potter&Brumfield **KR-2565-1** $ 50
- **50B cycle CW filter***(brand-new)* for 75S-3 (526-9494-00 • F455FA-05) $259
- F455FA21, 526-9427-00, SSB plug in filter, new in the box $175
- **811A TUBES** for 30L-1 amps–$22 • **6146Bs**– $15ea. or $36/ matched set
- 30L-1 caps,100µf, 450v,Sprague TVA1718*(slightly larger than original)* $7 10/$65
- **30L-1** power switch $19; Escutcheon $145; Input coils(any band) $38ea
- Oak 10070-4 on/off "AC" end switch for rotary sw. repair on Collins $ 15
- **Trim Ring** for 516/312 (small cabinet) plastic (609-1254-001) $ 29
- **KWM-380 to HF-380 Conversion Kits.** Includes A3 Lowpass Filter, Oscillator/Oven, "060" ROM & **"HF-380" Emblem**, plus instructions. $500
- SM-281 Desk Mike $59; MM-280 Mobile Mike $35; AC-2830 Headset $ 45
- KWM380 Control Interface. Our's is the original, not a substitute $ 75
- KWM380 Power Transformer 662-0650-020,shielded *LOW PRICE* $ 95
- KWM380 Spare **KNOB** set contains13 knobs,$79. Main knob only– $ 20
- KWM380 Panel Meter $65; AC/DC Power Plug or PowerSwitch $12.95
- KWM380 Display board, 100% complete $44.95; Double digit readouts $9
- Control Board, 638-6929-00, less U2/U17 $125 or 100% complete $175
- KWM380 Power Amplifier board,80% $34.95; 100% complete PA bd $350
- KWM380 Speech Processor, factory sealed, AC-3802 $250
- 380Filter **New Prices**: 140Hz-$199; 360Hz-$149; 1.7KHz-$139; 6 KHz-$99

1315 JONES STREET
OMAHA, NE 68102
ORDERS OR INFO *402-346-4750*
FAX: 402-346-2939

ORDERING INFORMATION
Enclose $2.50 for UPS on first lb. Add 30¢ per lb. up to 70 lb. Add $3 for CODs
For sign orders sent via Airmail
We accept the following terms: Checks, Bank Checks, COD
VISA, MC, AMERICAN EXPRESS

CATALOG 6 here in fall. Free with order or SEND $2 ala carte ($5 DX)

SURPLUS SALES OF NEBRASKA

WHERE THE HARD TO FIND PARTS ARE FOUND AND ON HAND

CIRCLE 11 ON READER SERVICE CARD

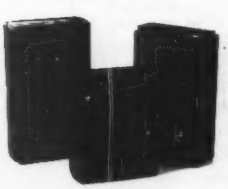
SUPER PERFORMANCE BATTERIES

UPDATED SUPER ICOM

SUPER ICOM BP-7S. 13.2 volts, 1200ma triple the capacity of the Icom BP-7, 5w output.
SUPER ICOM BP-8S. 9.6 volts, 1200ma, 50% more capacity than the Icom BP-8.
Both are rapid base charge only, or slide in wall charger, 4 inches high. BP-7S or BP-8S. $65.00

SUPER KENWOOD

SUPER KENWOOD PB-25S/PB-26S. 8.4 volts, 900ma, double the capacity of the PB-25/PB-26 for the 2500/2600/3500/3600. Charge with either the standard wall charger or drop in charger. 3 inches high. $65.00.



Exact replacement FNB-2 Nicad pack for Yaesu FT-404R/207R/208R/708R $22.50

SPEAKER/MICS

Icom HM-9	$35.00
Yaesu MH12A2B	$31.00

SUPER YAESU

SUPER YAESU FNB-4SH. 12 volts, 1000ma, double the capacity of the Yaesu FNB-4, 5 watt output. Rapid charge only. $71.00
SUPER YAESU FNB-3S. 9.6 volts, 1200ma, triple the capacity of the Yaesu FNB-3. 3.5 watt output. Rapid or wall charge. $65.00
Both are perfect for the 03, 09 and 727 series radios and are 4 inches high.

Inserts for:	
Kenwood PB-25, 25H, 26	**$25.00**
Icom BP-3	**$18.95**
Icom BP-5 (500ma)	**$24.95**
Icom BP-7 (500ma)	**$29.50**
Icom BP-8	**$29.50**

Full line for Yaesu 411/811/470. FNB-10/11/12/14 available.
Add $4.00 shipping& handling for first pack. CT residents add 8% tax.
Complete line of NICAD packs for Icom, Kenwood, Yaesu, Tempo, Santec, Azden, Cordless Telephones, Akaline, Nicad|& Gell-Cells. All NICAD packs include 1 year guarantee. Commercial Radio Packs available.
For all your battery needs, write or call today for a complete catalog. Dealer inquiries invited.
MADE BY HAMS FOR HAMS

VISA

PERIPHEX Inc.
149 Palmer Road • Southbury, CT 06488
(800) 634-8132 In CT (203) 264-3985 FAX: (203) 262-6943

MasterCard

CIRCLE 68 ON READER SERVICE CARD

1990 CALLBOOKS

THE QSL BOOK!

Extending a 69 year tradition, we bring you three new Callbooks for 1990 with more features than ever before.

The 1990 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and the U.S. possessions.

The new 1990 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

The 1990 Callbook Supplement will be published June 1, 1990, with thousands of new licenses, address changes, and call sign changes received over the preceding six months. This single Supplement will update both the North American and International Callbooks.

Every active amateur needs the Callbook! Fully updated and loaded with extra features, the new 1990 Callbooks will be published December 1, 1989. Order now for early delivery when these latest Callbook are available. See your dealer or order directly from the publisher.

☐ North American Callbook	
incl. shipping within USA	$31.00
incl. shipping to foreign countries	37.00
☐ International Callbook	
incl. shipping within USA	$33.00
incl. shipping to foreign countries	39.00
☐ Callbook Supplement, published June 1st	
incl. shipping within USA	$13.00
incl. shipping to foreign countries	14.00
SPECIAL OFFER	
☐ Both N.A. & International Callbooks	
incl. shipping within USA	$61.00
incl. shipping to foreign countries	71.00

* * * * * * * * * * * * *

Illinois residents please add 6½% tax.
All payments must be in U.S. funds.

RADIO AMATEUR callbook INC.
Dept. Q
925 Sherwood Dr., Box 247
Lake Bluff, IL 60044, USA

Tel: (312) 234-6600 VISA MasterCard

CIRCLE 31 ON READER SERVICE CARD

COMTELCO INDUSTRIES

Thousands Sold For Commercial Use!

19.95

144 - 450 MHz
MAGNET MOUNT
1/4 Wave Antenna
or
144 - 450 MHz
TRUNK LIP MOUNT
With Removable 1/4 Wave Antenna

Each supplied with 12 ft. of RG 58U Coax and a choice of BNC or PL 259 Connector. 150 Watt Power Handling Capacity. Frequency trimming chart included.

1-800-634-4622
1-312-790-9894
(In Illinois)

Quality products Made in the U.S.A.

COMTELCO INDUSTRIES INC.
P.O. Box 66429, Schaumburg, IL 60168

VISA MasterCard

CIRCLE 15 ON READER SERVICE CARD

MAKE LEARNING FUN with the CODEKEY 1000 Code Practice Oscillator

- —Compact and Easy to carry
- —Operates on 9V battery included
- —Adjustable Volume
- —Durable Metal Case
- —Variable Sidetone

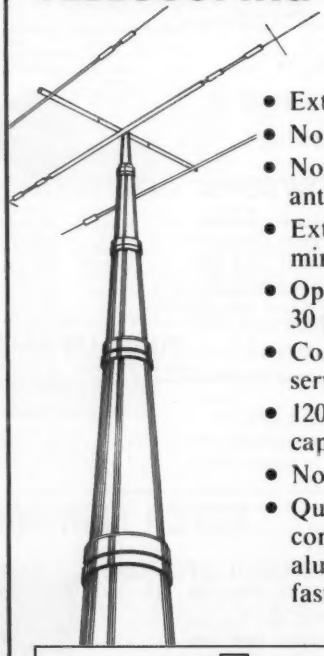
$19.95

TO ORDER —CALL— (718) 983-1416

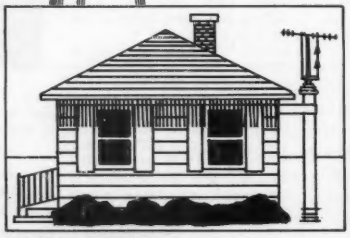
Media Mentors INC.
P.O. Box 131646
STATEN ISLAND
N.Y. 10313-0006

CIRCLE 241 ON READER SERVICE CARD

TELESCOPING ANTENNA MASTS



- Extended heights to 50 feet
- No guylines
- Normally retracted to conceal antennas from view or high winds
- Extended or retracted in two minutes
- Operated by compressed air — 30 psi
- Compact lowered height for servicing antennas
- 120-lb. nominal payload capacity/10 square feet
- No concrete foundation required
- Quality design and rugged construction of 6063-T6 anodized aluminum with stainless steel fasteners



WILL·BURT

Will-Burt Company P.O. Box 900
Orrville, OH 44667 216/682-7015

CIRCLE 105 ON READER SERVICE CARD

73 INTERNATIONAL

edited by C. C. C.

Notes from FN42

It's that time of year again when we in the Northern Hemisphere start thinking of snow, ice, and winter sports, and those of you in the Southern Hemisphere think of warm weather, sunshine, and summer. I think of the very nice summer we have had in New Hampshire and of all the ham activities that I have been involved in. And now, as I reflect on the end of summer (this was written in September), I wonder how many others around this beautiful Earth of ours have enjoyed theirs as much as I have mine.

But there have been many tragedies as well. Even though the airplane is still the safest means of travel, the number of aircraft accidents appear to be higher this year. Is this because there actually are more accidents, or because of an increased awareness presented by the news media throughout the world? Are there more riots and related deaths or just increased worldwide news releases?

Is communications important? You bet! Whether it is from the news media presenting reports of worldwide significance, satellites providing up-to-the-minute pictures of hurricanes, typhoons, or other weather phenomena, the current cellular telephone craze, or just talking with a friend on the telephone or radio, communications is a very important part of our lives.

Hams have become more and more involved. Even the news media understand the importance of amateur radio communications. In the United States the Federal Communications Commission has been asked to allow the news media to use ham radio operators to gather and send information of a commercial nature in times of emergency.

How many times have hams provided health and welfare communications after hurricanes, earthquakes, and other tragedies? Thousands, at least.

I think it's wonderful to have a hobby that provides so much enjoyment and at the same time provides a much needed service to the world. Keep up the good work, enjoy yourselves, and do great things!

Happy Holidays, and may the beginning of your new year bring prosperity and joy.

ROUNDUP

Brazil SERRA DO CACHIMBO, Brazil (AP)—Plane crash survivors who were stranded in the Amazon jungle for nearly two days said the pilot asked for their forgiveness and wished them luck as their jet crashed into dense vegetation earlier this year.

"We were ready to die, but the hand of God guided our descent," passenger Epaminondas de Sousa Chaves, 36, said after Air Force helicopters airlifted 41 survivors out of the jungle.

The Varig Airlines Boeing 737-200 crashed on a Sunday night, killing at least 10 of the 54 people aboard.

The Air Force found the plane Tuesday night after four survivors walked through the jungle and contacted authorities by **ham radio**.

[*I wonder how much farther the survivors would have had to walk to get to another form of communication, and how many others might have died before help arrived.—CCC*]

Next ITU Plenipotentiary Conference in Japan

Japan From the JARL News. At the Plenipotentiary Conference of the International Telecommunication Union (ITU) held in Nice, France, from May 23 to June 30 this year, it was approved that the next plenipotentiary conference, in 1994, will be held in Tokyo, at the Science and Technology Hall at Kitanomaru Park. This approval will be officially confirmed at the ITU's Board Meeting in 1991.

The most important conference of the ITU will be held for the very first time in the Asia and Oceania area.

Since this is a good opportunity for radio amateurs to have their problems understood by VIPs and leading members of worldwide electronic and communication circles, JARL and all others will work toward making all necessary preparations for a successful conference.

Gallium Arsenide Solar Cell for JAS-1b

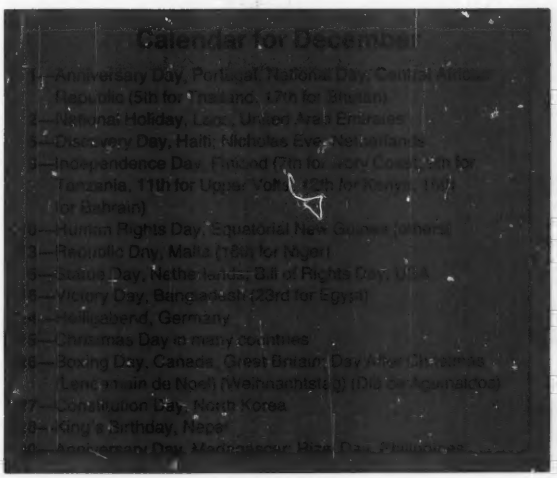
JARL has decided to use gallium arsenide solar cells for JAS-1b, the second Japanese amateur satellite to be launched in February 1990. The solar cells were recently delivered from Mitsubishi Electric Co., Ltd.

Compared to silicon solar cells, they are nearly forty percent more efficient in power generation. Production cost is two to three times higher than for silicon solar cells, but because of its greater efficiency, the gallium arsenide solar cell was developed and used in Japanese communication satellite CS-3, already launched by the National Space Development Agency of Japan (NASDA).

JAS-1b uses about 1,300 cells of two different sizes, 1x2 and 2x2 sq. cm. They are expected to generate 11 watts, which is 4.5 watts more than the power for FUJI, although the satellite itself has been enlarged a little bit.

[*The JARL also sent a list of Chinese Amateur Radio Stations with QSL information. Look for it on the 73 BBS (1-603-525-4438).*

—CCC]



Lithuania Seeks IARU Membership

Lithuania. News release from Ed Shakalis, KA1QOF. On June 12, 1989 at ARRL headquarters in Newington, Connecticut, a delegation from the "Worldwide Lithuanian Amateur Radio Net" met with Mr. Naoki Akiyama, Assistant to the Secretary for IARU (The International Radio Union), to discuss the LIETUVOS RADIJO MEGEJU DRAUGIJA (Lithuanian Amateur Radio Society) application for membership to IARU.

The Lithuanian group included Messrs. Sakalas Uzdavinys UP2BO from Vilnius, Lithuania, Flavius Jankauskas K3JA, Bronius Uzdavinys KB1PI, and from the USA, Ed Shakalis KA1QOF.

Mr. Akiyama explained in detail the necessary steps to become a member of the IARU. The Lithuanians thanked Mr. Akiyama for his consideration and help in this manner.

Sakalas UP2BO, a radio ham for 41 years, said that an application for membership to the IARU would be initiated by "The Lithuanian Amateur Radio Society" upon his return to Lithuania. He also said that they are working to get back their original call prefix "LY" which they were allowed to use for only one month earlier this year and one month last year.

[*Ed Shakalis KA1QOF, 10 John Alden Road, Plymouth, MA 02360*]

Netherlands. From the Radio Netherlands Programme Information Release (Aug–Nov 1989). For those of you who wish to receive this programme release in electronic form, dial your international access code, then 31 354 5395 to reach our IBM host computer in The Netherlands. It will work at 300/1200/2400 baud. We use the standard 8-N-1 format, and both CCITT and Bell tones. Material is distributed in North America by ANARC on 913 345 1978 (the board recently moved to Kansas) or Pineland NJ on 609 859 1910.

In Britain you can now call the Merkinstead bulletin board in Manchester. The number is 44 61 434 7059. Look for Radio Netherlands material in the "Hilversummary Room." If you run a computer bulletin board and would like an electronic feed of this news, please get in touch. Electronic versions of this news release are

updated.

A new series of QSL cards has been issued by Radio Netherlands to celebrate 25 years of the European Space Agency ESA. The technical centre for ESA is located in Noordwijk, on the Dutch North Sea Coast. Correct reception reports will get one of these new cards. The series is limited, available while stocks last.

Since September 5th, Radio Netherlands has been available in the United States through the C-SPAN "Flagship" audio channel. After initial experiments, the service is now being offered to cable companies across the US. If your cable company offers C-SPAN television, call your local cable operator and ask about the availability of the audio service. At present C-SPAN is picking Radio Netherlands off the air using professional equipment . . . if you can hear this service, tell us whether a studio feed by satellite would improve your listening enjoyment.

AUSTRALIA

Ken Goth VK3AJU
38A Lansdowne Road
St. Kilda, Vic. 3183
Australia

Ken reports that he received news about July 10 that he had won the VK HF Contest Championship for 1988. This is kind of a pentathalon minus one event, based on placings in their four annual HF contests.

The four contests are the John Moyle (emphasis on portable/field ops); the Novice (scores are loaded for low powered and club stations; separate sections for Novice and Full Calls), the Remembrance Day Contest (a sheer numbers game, involving VK, ZL, and P29 to commemorate ops killed in World War II); and finally the VK/ZL/O Contest.

The reward is a small cup—a replica of a larger permanent trophy which remains with the WIA with the names of winners over the years inscribed on it.

The meeting of the WIA Federal Executive in June resulted in plans for a new edition of the VK callbook, a recruitment drive, 80th anniversary celebrations, and a liaison with the federal government. Defeated was a move for a fairly substantial hike in WIA membership fees.

[Ken suffered a medical setback at the end of 1988, but is recovering well. He shed many responsibilities, but will continue as WIA Awards Manager, 73 Hambassador, and, of course, contesting.—CCC]

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev M.P.O. 85530
Israel

Crusader Fortresses Operation

For 100 hours, four stations operated concurrently (some of them multi-rig at): 4Z1A from the Crusader ruins in the Ashkelon National Park; 4Z2B at the reconstructed Belvoir fortress overlooking the southern Sea of Galilee and Jordan River; 4Z3C in the ruined Crusader port and stronghold of Caesarea on the northern coast of the Mediterranean; and 4Z5Y at Yehiam in the Galilee, the site of the Judyn Crusader fort. 55,000 contacts were made by the stations, operating around the clock under exceedingly good band conditions at this sunspot cycle high.

A very handsome award is available to those contacting all four stations. All one has to do is to send a written request for the certificate along with an excerpt from your log showing the details of the QSOs with each of the four stations, and a handling charge of either 7 IRCs or $5.00 US (do not send checks) to: Crusader Award, Israel Amateur Radio Club, POB 4099, 61040 Tel-Aviv, Israel.

QSL cards are being sent for each contact made through the QSL bureaus around the world, so every contact will be confirmed. The organizers of the event request that hams do not send QSLs and postage-accompanied requests for direct replies, since with the great volume of contacts these special requests cannot be accommodated.

Unofficial Report from Hungary

Ahron 4X1AT has just returned from a motor trip through Europe, and has interesting news. Although Israel does not have a reciprocal licensing agreement with Hungary, and to the best of our knowledge not many countries do, he was granted permission to operate his mobile station there! He returns home with the as yet unofficial good tidings that radio hams from around the world, bringing with them a letter from their national radio society attesting to their being an amateur of good standing, along with a copy of their license, will be allowed to operate there. Ahron says that he was received most cordially at the border, and the officials did not even beat an eyelash at the sight of his whip antenna on the car and radio gear. Apparently, the same warm welcome mat is put out to radio amateurs visiting Hungary from all over the world.

I'm sorry to say that the above information is sketchy, and hopefully someone from the Hungarian Amateur Radio Federation will be able to supply *73 International* with the complete details.

From Ahron: "Hungary is a beautiful country to visit, and during July, I worked ON6UG/HA on AMSAT OSCAR 13. Freddie was operating from a campground 45 kilometers west of Budapest, and his 2 meter, 70 and 22 centimeter antenna was a homemade ten-foot dish, putting excellent signals into the satellite. If this Eastern Bloc country will allow foreign nationals to operate such suspicious-looking gear on their territory, it would definitely point to the dawning of a new age of enlightenment with the relaxing of international tensions."

In Hungary there are two license classes—the HA prefix with full privileges on all the bands, and the HG prefix, apparently restricted to VHF and UHF operation. Ahron says that the responsibility for amateur licensing is apparently now in the hands of the newly reorganized Hungarian Amateur Radio Federation, and not the government. Anybody out there who can set the record straight?

The 1989 Annual Membership Assembly

In late May, in accordance with the IARC bylaws, the club members were assembled to express themselves and elect a new slate of officers for a year's term. As always, a major motive for the hundreds of hams from around the country to come is the social aspect—to meet face to face the physical entities from whom the voices, and the words on the packet-fed computer screens, emanate.

The place—a large auditorium in the Tel Aviv University, home of the world-renowned 4X6TU beacon on 14.100 MHz. Shlomo 4X6LM was elected to chair the meeting. He invited Yankele 4X4AH, IARC president, to the podium for his words of greeting to all, and praise of IARC achievements in the past year. Israel Biber 4X1OR, speaking on behalf of the Communications Ministry, praised the participation of the radio amateurs in the Israeli aid mission to earthquake-striken Armenia. Israel told us that a new syllabus for the Grade "A" license exams had been approved and that a reciprocal licensing agreement had been signed between Denmark and Israel.

Awards: Jim 4X1RU was acclaimed outstanding amateur of the year for his operation of his packet BBS/Gateway station that serves as an important junction on the crossroads of Europe, Asia and Africa, with hundreds of messages being cleared through his station.

Hardy 4X6VH was named for his work as an instructor at 4X4HF, the Bet Miller Radio Club in Haifa, and his handling of the huge volume of QSL cards for the IARC QSL bureau. Avner 4X1GE was cited for his excellent series of technical articles in *HaGal*, the IARC magazine, articles which no amateur radio publication in the world would be ashamed to print.

Ralph 4X1IF's outstanding accomplishments in moonbounce were awarded, and Shoshana and Ahron, 4X6OL and 4X1AT, were granted the recognition due them for their successes in bringing scores of people to earning their amateur radio licenses.

Ahron 4X1AT, stepping down as IARC general secretary, recalled the Passover operation putting four stations on the air from Crusader forts for 100 hours, and said that work continues in getting Israel into the European Common License Group. Yossi 4X6KJ said that in the past year membership services greatly expanded. Michael 4X6PZ, who was the IARC liaison person with the Communications Ministry, reported that no more repeaters were being authorized on the 70 cm UHF band, as this slice of spectrum was indispensible to other services. Authorization of autopatches on the repeaters still remains a problem, but on the brighter side the Grade "A" syllabus he had initiated had been

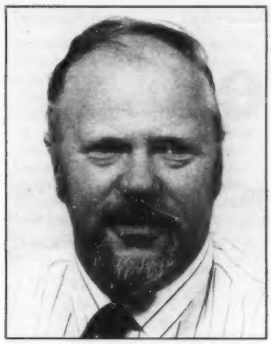


Photo A. Peter Strauss ZS6ET, IARU Liaison Officer, SARL, and 73 Hambassador.

authorized, and he had worked with the "Open University" on a course to prepare hopefuls for the Grade "B" examinations. Kuti 4X6OM, treasurer, gave the financial report, and Aharon 4X6SF reported on the year's special events. Moshe Laufman, IARC spokesman, said that Israel Television would be producing a documentary on amateur radio.

After the intermission for refreshments and general ragchewing, the meeting reconvened with the traditional open forum for IARC members to express their ideas and opinions. Then the serious business of electing a new executive, formed by 4X1IO, 4Z4's BQ, PE and ZB, 4X6's KJ, OM, PZ, SF and YA. Comptroller committee is 4X1FU, 4X4ND and 4Z4JT, and membership committee is 4X6LD, 4X6AS and 4X4ML. 4X6KJ's proposal for constitutional reform was passed to a legal committee that will present an amendment for next year's general assembly to vote on.

IARC New Executive Goes to Work

On the 9th of July the outgoing and incoming executives got together to hand over portfolios, and these are the new officers' positions: 4X6KJ, general secretary; 4X6PZ, second in charge and liaison to Communications Ministry; 4X6YA, secretary; 4Z4BQ, assistant secretary; 4X6SF and 4Z4ZB, special events; 4Z4PE, repeaters; and 4X1IO, packet and digipeater coordinator.

4X1FU—DXer of Distinction

Yitzhak Halfon 4X1FU has served and continues to serve with the IARC incoming QSL bureau, and his DX bulletins are available on the packet network. Now the news comes to us that Yitzhak has made the Five Band DXCC, and is also on the DXCC Honor Roll. Hat's off for your persistence, that has paid off in these marks of distinction!

Rishon Hams Meet Weekly

Joining the tradition of weekly get-togethers of radio amateurs in the larger urban centers, the hams of Rishon Le'Tzion now meet Friday afternoons at a sidewalk cafe at the Rishon Mall. Recently, the mayor passed by the 17 hams sitting there, struck up a conversation, and ended up inviting them all to his home!

[*How often has that happened to any of you?*]

Dayton in Israel?

Israel's first real hamfest was held on the 18th of October in Natanya, a good place convenient for most amateurs. Organizers of this event were 4X6TQ, 4X1KT and 4X6KF.

[*This was written in September. Hopefully it went well.—CCC*]

Dataspace 1989

Representing Israeli hams at Dataspace 1989 at the University of Surrey in England from July 27 through 31 were Shlomo 4X1AS and Yair 4X4GI. Yair wrote a comprehensive article explaining the intricacies of AMSAT Phase III in the IARC publication seven years ago, and in 1984–5 gave a fortnightly series of lectures for amateurs on amateur satellites, in what was then the AMSAT-Israel chapter. Many of us who have since gone into this most exciting mode of communications will be waiting for their report of the conference.

SOUTH AFRICA

Peter Strauss ZS6ET
P.O. Box 35461
Northcliff 2115
South Africa

Peter reports through a note from SARL Headquarters that extracts of the SARL HQ bulletin will be airmailed to many publications. Local news items will be deleted. Should you require such news on magnetic media (IBM 360kB 48 TPI PC/XT) or via packet (your national licence conditions permitting), please advise the SARL IARU desk.

At present, co-ordinators for German, Portuguese, Scandinavian, French, Dutch, Spanish, Italian and Arabic languages have been or will be appointed.

The South African Radio League actively promotes the issue of temporary licences for foreign radio amateurs intending to visit the Republic of South Africa and the general liberalisation of licencing of visiting foreign radio amateurs worldwide. Since 1981 the licence authority in Pretoria issues short-term licences to applicants for a nominal fee of only Rand 12 (approx. US $5) for a three-month period. Amateurs from countries whose administrations conclude a bilateral agreement with South Africa receive such permit free of charge. Guest licences may be issued to applicants from any country, and have indeed been issued to visitors from many countries already.

If the administration in your country issues a guest licence only based on bilateral agreements, and no agreement as yet has been concluded with the administration in the Republic of South Africa, you are cordially invited to contact the SARL HQ to discuss preliminaries to such an agreement.

The administration of the Republic of South Africa has concluded bilaterial agreements with the following list of countries: Bophuthatswana, Botswana, Chile, Ciskei, German Federal Rep. (including West Berlin), Great Britain, Israel, Portugal, South West Africa/Namibia, Swaziland, Switzerland, Transkei, Venda, United States of America, and Zimbabwe.

Foreign amateurs should, however, note that the South African licence authority will consider applications for a short-term permit from any amateur in any country holding a CEPT Class 1 or CEPT Class 2 compatible licence. Amateurs holding only a Novice grade licence may not be issued with a short-term permit, as there is no compatible licence grade available in South Africa.

New address for the SARL is: South African Radio League Headquarters, PO Box 2327, Johannesburg 2000, South Africa. Tel: (011) 484-2830.

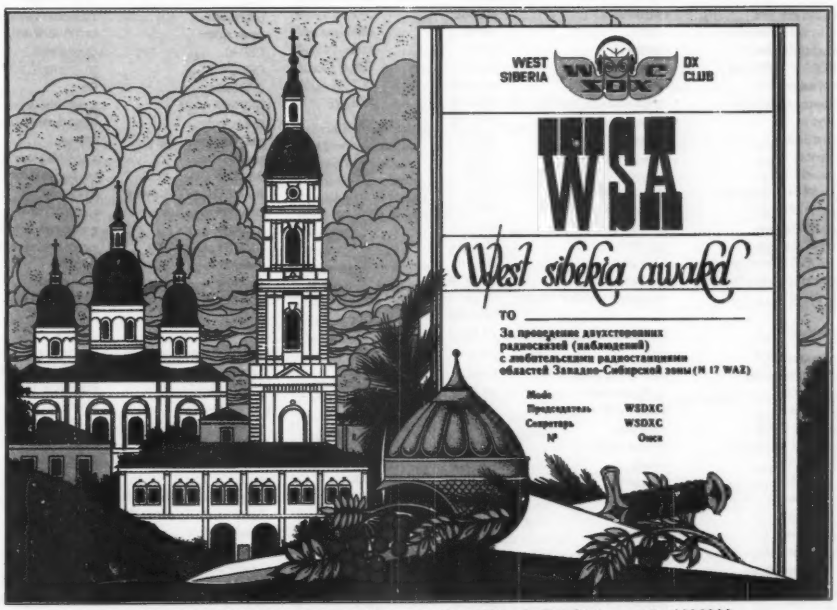


Photo B. WSA West Siberia Award from the West Siberia DX Club, sent by UA9MA.

1989 Annual Index

Subject/Article*	Description/Column	Author	Issue	Page
Amplifiers, Power, Audio, and Preamps				
10 GHz	RF preamp	WB6IGP	AUG	49
220 MHz DMOS	power amp	W6YUY	JUN	38
29 MHz Amp	Circuits	WA4UZM	MAR	66
preamp circuit	for 6m	WB6IGP	SEP	54
Switching for older RF amps	universal driver/amp relay	WA4BLC	MAR	19
W1FB HW-7 linear amp	QRP	WB8VGE	APR	88
Antennas				
10 GHz	dish system	WB6IGP	APR	54
1269 Helix	array	WA8WBP	MAY	71
12 and 17m	15 dB gain beam	W6YUY	SEP	20
2m/440 MHz	for HT	W3RW, W3LOY	APR	18
30m Trap	add band to AV-4/5	KE8UV	SEP	11
3/4 Inverted "U"	160m antenna	WA3EKL	SEP	32
80m wire	array	W2OZH	AUG	24
all-band HF	Aerial View	W7XU	FEB	81
CDR Antenna Controller	upgrade	WA6LOD	JUL	50
dual-band 2m/220 MHz quad	Homing In	K8OV	FEB	87
HF vertical	full-wave	AF8B	AUG	42
Inexpensive Hardline	Z match for CATV hardline	KA9LNV	JUL	16
Low-Band Wonder	multi-band HF loop	WA4BLC	JUL	46
low-power	satellite operation	WA5ZIB	JAN	91
mobile HF antennas	Hustler mod	W7XU	JUL	63
Mode-L dish	construction	WB5ZDP	MAY	18
Mode-L, My Way	Cheaply reduce 23cm line loss	WA8WBP	MAY	50
polarization	Homing In	K8OV	APR	74
QRP SWR Bridge	match antenna system	G4FAI	JUN	44
quads & yagis	for RDFing	K8OV	JAN	77
Safari Special	vertical HF dipole	N4UQT	SEP	44
satellites	antenna systems	WA5ZIB	APR	76
slingshot	2m	KA8OGD	APR	32
Three-in-One Antenna Tuner	random wire	KB4ZGC	NOV	44
troubleshooting	Aerial View	W7XU	MAR	73
turnstile	enhancement	ZL1AAN	MAY	[illegible]
Vertical Antennas at HF	Part I	W1GV	SEP	38
Vertical Antennas at HF	Part II	W1GV	OCT	70
WA6TEY quad	144/220 MHz	N6JSX	APR	26
yagi, crossed	for 70cm	WB5ZDP, KG5OA	MAY	29
ZRO tests; antennas	Hamsets	WA5ZIB	APR	76
Computers/Software				
AMSAT Tracking Software	all types	W5IU	MAY	38
Aries-1	logging for RTTYers	KE8KB	APR	28
Autosketch	CAD software	VE6BGL	JAN	30
C-64 Voltage Protector	<$12	W8YJO	JAN	40
Control Rig from PC	interface	N7IPY	AUG	34
CQFCST, MUF SCAN	Propagation program	W1XU	FEB	94
DX Helper	review	WB8EHS	OCT	59
Feed an Apple to IBM	computer/monitor interface	WB4DCV	APR	22
Flodraw	review	WB9CWE	OCT	99
Grid Square	location aid	WB8IGP	MAR	55
Hamcall	on-line callsign dir	NS1B	JAN	46
Instant Track	sat tracker	N4RVE	NOV	16
My SX-64 Runs Digicom!	packet interface	KA9ELV	OCT	24
Net/ROM-Nordlink	software piracy controversy	WB2KQI	JUN	34
rig/PC interface	construction	N7IPY	AUG	34
RS-232 for C-64	one-chip	KB8CDQ	OCT	34
RS-232/TTL level converter	RTTY Loop	WA3AJR	SEP	78
Silicon Ephemeris Tracker	satellites	WA5NOM	MAY	12
VHF/UHF	propagation prediction program	W7XU	APR	49
		correction	JUL	83
WB2DND	DX logging	VP2ML	APR	81
Construction				
10 GHz Test Equip	backfire/boomerang	WB6IGP	JAN	12
12 and 17m	15 dB gain beam	W6YUY	SEP	20
1269 Helix	antenna array	WA8WBP	MAY	71
220 MHz DMOS	power amp	W6YUY	JUN	38
220 MHz Transverter	all-mode XVTR	W6YUY	JAN	18
29 MHz Amp	Circuits	WA4UZM	MAR	66
2m/440 MHz	HT antenna	W3RW, W3LOY	APR	18
2m Mobile Rig	2W to 40W booster	N8KDD	DEC	22
30m Trap	for AV-4/5	KE8UV	SEP	11
3/4 Inverted "U"	160m antenna	WA3EKL	SEP	32
AFSK generator	one-chip project	WA3AJR	AUG	60
Attenuator Control	Homing In	K8OV	MAR	98
Auto PTT	Circuits	N6JSX	MAR	66
Az-El rotor	from two Az rotors	WA3ETD	MAY	24
Bargain Audio Frequency Meter	<$10	KB5CTH	NOV	28
BitChaser	digital test equipment	K4OND	NOV	18
C-64 Voltage Protector	<$12	W8YJO	JAN	40
COCOA	80m array	W2OZH	AUG	24
Control Head	for running TS-440S mobile	WB8UVN	MAR	18
Crystal Set	classic design improvement	Haas	APR	12
CTCSS	PL tone generator	N6UE	AUG	13
		corrections	OCT	92
CW IDer	for repeater/RDF fox	WN8EHE	FEB	54
CW Transceiver	for 20m QRP	G3YCC	JUN	65
		correction, schematic	SEP	88
demodulator	RTTY Loop	WA3AJR	JUN	72
Deviation Meter	Circuits	N6JSX	MAR	66
Feedpoint Protection	for bumper mount antenna	K3OF	MAR	47
field strength meter	QRP	WB8VGE	SEP	81
Flavorig!	80m CW rig	KB1UM	NOV	12
Four In/Five Out	adjustable audio	KA8LDB	JUL	37
FT-727/MFJ 1278 cable	HT/TNC cable	N4REE	AUG	58
G3IGU Transceiver	80m QRP	G3IGU	JUN	26
Hamfester	Better HT operation at 'fests.	NM9P	SEP	34
HF vertical	full-wave	AF8B	AUG	42
IC-2AT mike	Circuits	KC3YB	APR	87
IF Shift	Add IF shift to rig	W8WUZ	AUG	53
increase voltage	Circuits	W7FVM	APR	87
Inexpensive Hardline	Z match	KA9LNV	JUL	16
interface	rig/PC control	N7IPY	AUG	34
Kaboom Micro Keyer	easy CW mobile	KB1UM	SEP	28
		corrections	OCT	92
		modification	DEC	64
LED Checker	<$5	Thompson	JAN	61
line sampler/7-pole filter	ATV	WB8QCD	FEB	64
Low-Band Wonder	HF loop antenna	WA4BLC	JUL	46
Marker Generator	calibration	WB6DFQ	JAN	35
Meters	from old meter parts	KC3YB	JAN	58
Mobile Audio	rig audio to car speakers	N1II	JUL	43
Mode L Dish	antenna	WB5ZDP	MAY	18
Mode-L, My Way	less feedline loss cheap	WA8WBP	MAY	50
My SX-64 Runs Digicom!	packet interface	KA9ELV	OCT	24
Need FM?	FM add-on	KB2BQK	AUG	48
One-Stage 80m CW	transceiver	WB3ELL	FEB	28
Oscillator	test equipment	VE1VQ	JAN	29
Packet Racket Lip Zipper	packet audio silencer	KB1UM	OCT	13
PCB	silk screen method	WB6IGP	NOV	64
PCB	TEC-200 Process	DL2OM	APR	100
polarization	mode/band switch box	K8OV	APR	74
power divider	for 2304/2160 MHz	WA3JUF	JUN	61
QRP-40	Ramsey xmtr	WB8E	DEC	32
QRP CW	30, 40m rig	NZ5G, N5HNN	JUN	20
QRP Station	6m	ex-YU1FR	JUN	50
QRP SWR Bridge	match antenna system	G4FAI	JUN	44
Quickchanger	mixed-mode operation	KA3MRX	OCT	84
relay interface	Circuits	W6WTU	APR	87
resistors	customizing resistors	W8DZQ	APR	100
RS-232 for C-64	one-chip level converter	KB8CDQ	OCT	34
RS-232/TTL to TTY converter	RTTY Loop	WA3AJR	SEP	78
Safari Special	vertical HF dipole	N4UQT	SEP	44
S-COM 5K	repeater link controller	KF7FW	MAR	24
Super Simple Attenuator	variable, easy to build	K3OF	JAN	14
Switch Box	3-Position	Pelaez	DEC	70
Switching	driver relay for older RF amps	WA4BLC	MAR	19
TCM 3105 modem	1200 baud packet	N4PLK, KJ4GP, W4KUM, WD4PVS	FEB	42
		correction	MAR	14
Three-in-One Antenna Tuner	random wire	KB4ZGC	NOV	44
turnstile antenna	OSCAR 11 downlink	ZL1AAN	MAY	32
Uniden HR-2510	easy mobile tuning	K3JML	NOV	38
voltage doubler	Circuits	WA3IAC	JUN	61
VOX unit	for HTs	KA8HML	DEC	9
WA6KLQ's noise meter	Homing In	K8OV	AUG	62
yagi, crossed	for 70cm	WB5ZDP, KG5OA	MAY	29
Diagnostics, Troubleshooting, Repair				
Bargain Audio Frequency Meter	construction	KB5CTH	NOV	28
coax losses	how to measure	W7XU	AUG	55
Fix or Ship?	Ask Kaboom	KB1UM	JUN	74
heatshrink tubing	using heat gun	K3OF	JUL	93
IC test clip	easier clip attachment	KK4CS	OCT	98
QRP rigs	troubleshooting guide, QRP	WB8VGE	JUN	76
Revamp Bird Elements	calibrate, repair	HL9BK, K2KSY	APR	48

Subject/Article*	Description/Column	Author	Issue	Page
Diagnostics, Troubleshooting, Repair (cont'd)				
RF circuitry troubleshooting	Ask Kaboom	KB1UM	MAR	67
RF feedback	Ask Kaboom	KB1UM	JUL	49
schematics	how to read	KB1UM	AUG	65
Switching Power Supplies	chart, guide	W9NGP	JAN	50
TVI	ferrite bead fix	W8WUZ	AUG	82
VOM	how to use	KB1UM	APR	66
weatherproofing	removable	WA4BLC	AUG	82
what component to suspect first	Ask Kaboom	KB1UM	FEB	78
which connector to use	Above & Beyond	WB6IGP	JUL	74
Which End is Up?	easily find coax connector short	W7RXV	JAN	38
Digital Modes: Packet, RTTY, AMTOR, etc.				
AFSK generator	one-chip project	WA3AJR	AUG	60
Amateur Packet Networking	5 major packet network packages	WB6RQN	OCT	60
BitChaser	digital test equipment project	K4OND	NOV	18
demodulator	RTTY Loop	WA3AJR	JUN	72
Digital Dreams	future packet	N3EUA	OCT	28
FCC packet regulations	Packet Talk	WB6RQN	DEC	47
Getting High on Packet	improve HF packet	WB6RQN	FEB	50
HF Packet Tuning Aid	construction	W8IOJ	OCT	80
IC-22S on Packet	convert rig to packet channels	KE4PC	OCT	31
KAM Box mod	packet and WEFAX	N4AQG	OCT	32
KAM RTTY	mod	K4COP/AFA2KQ	DEC	70
My SX-64 Runs Digicom!	packet interface	KA9ELV	OCT	24
Packet & Hi-Tech Nomadics	CMOS 68000	N4RVE	OCT	48
Packet BBS	tutorial	WB6RQN	NOV	50
Packet in Japan	overview	WA1LBP	OCT	38
Packet Racket Lip Zipper	auto packet audio silencer project	KB1UM	OCT	13
packet/voice	switch box	KA4LAU	AUG	58
PCBS	DX	VP2ML	FEB	79
ROSE, TCP/IP	Packet Talk	WB6RQN	DEC	47
RTTY survey	results	WA3AJR	NOV	78
Setting Up Packet Station	guide	WB6RQN	OCT	14
Standardizing Interface	for radio/TNC	WB6RQN	OCT	40
TCM 3105 modem	1200 baud packet	N4PLK, KJ4GP, W4KUM, WD4PVS	FEB	42
		correction	MAR	14
TCP/IP for Macintosh	overview	WA8DZP	OCT	68
TexNet Packet Switching	overview	WD5IVD	OCT	54
TNC DCD Circuit	improvement	N7CL	OCT	50
TNC PPM w/o PC	instant TNC mailbox	WB6WKB	OCT	30
TNC with HT	Circuits	WA1PWF	FEB	76
DXing				
Antarctica	QTH-DX	N6HYK	APR	108
Congo	DXpedition	VP2ML	APR	81
DXCC countries	new list	staff	OCT	66
		update	DEC	64
ionization	Propagation	W1XU	APR	110
Ireland	QTH-DX	N6HYK	MAR	80
QSL management	F6FNU	VP2ML	JUN	88
QTH K2OWR	Above and Beyond	KT2B	JAN	79
Rotuma	DX	VP2ML	MAR	96
See also *73 International* in each issue.				
General Interest				
6m operation	subband allocations	WB6IGP	SEP	54
10m Survival Guide	subband allocations	N8DNX	JUL	12
1989 Holiday Wish List	buyer's guide	staff	NOV	60
bandwidth; QRM	Ask Kaboom	KB1UM	JAN	94
Dayton Hamvention	1990	WA6ITF	DEC	60
Docket 85-22	frequency coordination	WB6MQV	APR	86
DX Dynasty Awards	list	WB2DIN/staff	OCT	65
Goldwater	no-code stance	WA6ITF	JUN	81
grounding	tutorial	KB1UM	SEP	60
Hacker's Shack	in praise of experimenters	N4RVE	JAN	44
Hamfest Survival Guide	shopping tips	WB9IVR, AA4QA	APR	20
Harmonic History	ham children	O'Connell	JUL	28
JEZ	Swiss ham education	HB9DU	AUG	46
KA9WTE	Ham Profiles		OCT	17
KA1TGA	Ham Profiles		DEC	17
KA1UKM	Ham Profiles		DEC	17
KA2RMW	Ham Profiles		OCT	17
KB2GGW	Ham Profiles		NOV	17
KC4IQP	Ham Profiles		AUG	17
KG5CS	Ham Profiles		AUG	17
N6PNY	Ham Profiles		SEP	33
no-code	proposed "Communicator" license	WA6ITF	NOV	58
Part 97	Looking West	WA6ITF	AUG	66
Sing for the Unsung Heroes	In praise of club volunteers	K5CVD	NOV	36
Spread-Spectrum	overview of this advanced mode	N4ICK	JUN	12
State of the Art	guide to getting trade journals cheaply	W1UO	APR	52
survey	RTTYers	WA3AJR	MAR	63
W8JA	Ham Profiles		SEP	33
WK2X	Ham Profiles		NOV	17
Microwave Operation				
10 GHz	antenna system	WB6IGP	APR	54
10 GHz units	Above & Beyond	WB6IGP	JUN	70
24 GHz	general operation	WB6IGP	AUG	76
backfire/boomerang	10 GHz test equip	WB6IGP	JAN	12
brick oscillators	Above & Beyond	WB6IGP	DEC	66
Microwave Oven	13cm QRO transmitter	KA9BYI	JUL	54
propagation	Above & Beyond	KT2B	FEB	70
satellites	Mode S	WA5ZIB	JUL	64
test equipment	for detector mount	WB6IGP	JAN	12
Mod'fications				
Flavorig!	80m CW rig	KB1UM	NOV	12
FT-411	improve receiver sensitivity	KB1UM	DEC	72
Hustler mobile antenna	increased gain	W7XU	JUL	63
HW-8/9	QRP	WB8VGE	FEB	86
IC-2AT	antenna connection	KA8CNI	SEP	66
IC-2AT	coupling audio, PTT	AF6K	AUG	58
IC-37A	5 improvements	Independent Rptr. Assn.	SEP	66
IC-551	amp switching circuit	WB6IGP	SEP	54
IC-745; attenuator	driving MM 432/28 XVTR	VE6CBN	DEC	70
IC-761	extra filter bandwidth	KK4CS	OCT	98
IF Shift	add IF to rig	W8WUZ	AUG	53
KAM	improve RTTY reception	K4COF	DEC	70
KWM-2	adds hang-type AGC	AC8R	APR	67
Microwave Oven	13cm QRO transmitter	KA9BYI	JUL	54
R-7000	better AM on this rig	Borde	JUL	93
Ramsey PA-20	fix TVI	K1LNJ	JUL	93
TM-701A/231A/331A/431A	improve FM	NA1A	SEP	66
TS-430	fix for blank out	N7ETV	JUL	93
TS-440S	IF unit	OH7DC/OH3NWP	OCT	98
TS-930	for AMTOR keying	W5AU	AUG	82
Uniden & HTX-100	mod to increase output power	KC4HGH update	NOV	76
Uniden HR-2510	add FM split	WB9WDH, WA9QDZ	APR	34
		correction	JUN	11
		correction	AUG	90
Uniden HR-2510	easy mobile tuning	K3JML	NOV	38
Using NEC tubes in FT-101E	circuits	WB8RNI	FEB	76
VisiTel	modified for amateur SSTV	W8ASF	JAN	36
VCXO	CB-to-10 mod	N6BSG	MAR	43
Packet—see Digital				
Power Supplies				
batteries, types; testing	QRP	WB8VGE	JAN	71
Gel/Cell	batteries	WB8VGE	DEC	54
homebrew a 220V supply	QRP	WB8VGE	MAR	82
increase voltage	Circuits	W7FVM	APR	67
Switching Power Supplies	chart, guide	W9NGP	JAN	50
troubleshooting	QRP	WB8VGE	JUN	76
universal charger	QRP mobile	WB8VGE	AUG	72
voltage doubler	Circuits	WA3IAC	JUN	61
RDFing; Fox-, or T-hunting				
2m/220 MHz quad	Homing In	K9OV	FEB	87
CW IDer	construction	WN8EHE	FEB	54
Handy Tracker	TDOA	K9OV	SEP	58
loop antennas	6m	K9V	DEC	50
Mobile T-Hunting	Homing In	K9OV	JUL	68
quads & yagis	Homing In	K9OV	JAN	77
TDOA	sources	K9OV	NOV	52
WA6TEY quad	144/220 MHz RDF	N6JSX	APR	26
Reviews & Recommendations; Books & Tapes				
1934 Shortwave Manual	review	NR1A	JAN	54
44 Power Supplies	review	WB9RRT	SEP	50
Communications Satellites	Monitor's Guide	WA5ZIB	DEC	26
Computing Across America	review	KA9KAG	NOV	90
Digital Communications with AR	RTTY Loop	WA3AJR	JAN	59
For Beginners	Welcome Newcomers	KA1UKM	NOV	4
KB6MT Tech Course	video, tapes	Reneau	MAR	31
Microprocessors in Industrial Measurement and Control	review	WB9RRT	SEP	50
Mnemonic Morse	CW learning aid	W8LHL	MAR	52
Shortwave Propagation Handbook	guide to predicting propagation	W1XU	JAN	92
Uno, Dos, Cuatro	"numbers" stations	W3LOY	AUG	31
Reviews, Equipment				
AEA FSTV-430	70cm ATV	N8IVN, NQ9I, WB8ELK	JUL	20
Ameritron AL-80A	HF linear amp	W1FYR	AUG	28
Amiga AVT	SSTV/FAX interface	K3HKR	JUL	29
AEA AT-300	HF tuner	KA1LR	SEP	18
Ampire 146-OS	preamp	WB3JZD	MAY	67
		phone number	AUG	90
Antennas West	solar power supply	WB8VGE	JUN	54
Austin Tribander	144/220/440 MHz	W1XU	APR	41
Azimuth 100 Fluxgate Compass	grid square locator aid	WB8NOA	JUL	66
Bird Model 4381	wattmeter	WB9RRT	JAN	32
Breadblox	breadboarding system	WB9RRT	DEC	25
Coaxial Dynamics 81000	wattmeter	KT2B	JAN	80
Delta Loop DL-102	10m full-wave antenna	W1FYR	APR	38
DRSI PC	Packet Adapter	WB8RQN	OCT	20

Subject/Article*	Description/Column	Author	Issue	Page
Reviews, Equipment (cont'd)				
Elenco AC Adapter	Non-invasive AC probe	WB9RRT	NOV	46
FRG-9600	60–905 MHz multi-mode receiver	W1XU	NOV	24
FT-411	2m HT	KB1UM	JUN	14
FT-470	2m/70m HT	KB1UM	DEC	18
FT-790RII	all-mode 70cm transceiver	KT2B	MAR	49
GMS-403 NiCd Charger	dewhiskering	KA9KAF	JUL	34
GRAPES	56K bps modem	KA9Q	OCT	42
Ham-10	mobile 10m antenna	N1BLH	FEB	33
Heath HK-21	micro TNC	N7KHU	MAR	38
		correction	MAY	10
IC-2SAT	2m HT	KB1UM	DEC	29
IC-2GAT	2m HT	WA4BLC	FEB	46
IC-781	HF rig	WA4BLC	FEB	18
ICF-SW1	shirt pocket SW receiver	KA5S	FEB	48
ISOTRON 80	compact 80m antenna	VE1GA	MAR	20
Kantronics KAM	multi-mode data controller	WB6RQN	AUG	18
M-600 FAX	Info-Tech converter	WB2QLI	FEB	24
Maggiore HPC-201	repeater controller	K1ZJH	MAR	37
Magnus Mobile Amp	600W Amp	WB6NOA	FEB	34
MFJ-1276	Multi-Mode Data Controller	N1BLH	APR	64
MFJ-931 Tamer-Ground	creates artificial RF ground	N1BLH	MAR	34
MFJ-986	differential-T antenna tuner	WA4BLC	JUN	42
Mirage D15	70cm amp	KT2B	DEC	45
PacComm's NB-96	9600 baud packet modem	W2VY, K6KGS	NOV	30
PC Electronics' TX-33	33cm ATV transmitter	WB8ELK	JUL	44
Portasol	butane soldering pencil	WB9RRT	JUN	36
Pro-67 HF	multi-band HF beam	W4WDR	FEB	38
Procomm Supercone	100 MHz–1 GHz discone antenna	W1XU,W7KTK	APR	14
		phone no. correction	MAY	65
		phone no. correction	AUG	90
Ramsey SR-1	4–10 MHz receiver kit	WA9PYH	AUG	38
Ranger AR-3500	10m mobile rig	N1BLH	JUN	30
Shakespeare Big Stick	10m vertical antenna	WA4BLC	FEB	26
Star Circuits Filter	TVI filter for 6m	W8CM	FEB	57
TH-25AT	2m HT	KB1UM	APR	70
TM-621A	2m/220 MHz mobile transceiver	KA1LR	APR	24
TS-680S	HF transceiver	N1BLH	SEP	30
TS-790A	2m/70cm/1.2 GHz satellite transceiver	W3LOY	MAY	34
TS-940S	HF rig	WB6RQN	FEB	12
		correction	JUN	11
Uniden Bearcat	BC100XLT scanner	KA1MDA	SFP	52
Universal M-7000	multi-mode digital decoder	WB2QLL	APR	44
Wilson 1000	10m mobile antenna	N1BLH	JUN	82
See *Computers and Software* for reviews in this category.				
Satellite Operation				
1269 MHz Helix System	array	WA8WBP	MAY	71
70cm crossed yagi	construction	WB5ZDP, KG5OA	MAY	29
AMSAT-NA Microsats	overview	N5BF	MAY	83
A-O-13 Mode B	Hamsats	WA5ZIB	JAN	91
Decoding OSCAR Telemetry	Part I	G3RUH	MAY	20
Decoding OSCAR Telemetry	Part II	G3RUH	JUN	58
		addition, addresses	SEP	88
DXing	A-O-13	WA5ZIB	NOV	72
Experimental OSCARs	UoSATs overview	G8/K8KA	MAY	62
Find Your Signal	Doppler shift tutorial	AA6CQ/VE6	AUG	44
Instant Track	sat tracker review	N4RVE	NOV	16
JAS-1b	Hamsats	WA5ZIB	SEP	62
mobile operation	Hamsats	WA5ZIB	AUG	64
Mode L	Az-El rotor	WA3ETD	MAY	24
Mode L	dish antenna	WB5ZDP	MAY	18
Mode L	microwave modes	WA5ZIB	JUL	64
Mode L	reduce line loss	WA8WBP	MAY	50
Mode S	receive techniques	WA3ETD	MAY	36
Mode S	ZRO tests	WA5ZIB	DEC	56
Polarizing/Matching Selector	phase selector project	ZS6BTD	MAY	54
Poor Boy Satellite Station	coat-hanger Mode A uplink antenna	N5LKJ	DEC	24
QRP "Black Bag"	Portable OSCAR station	N6DGK	JUL	26
Radio Links to Phase III-D	AMSAT-DL Phase 3D and 4 overview	DJ4ZC	MAY	77
RS-12/13	frequency plan	WA5ZIB	SEP	62
SAT TRAK III	auto antenna tracker	N5LCO	MAY	44
Space Education Network	Schools tune to A-O-13	K9PVW, Barr	MAY	74
Space Symposium '89	Hamsats	WA5ZIB	FEB	60
turnstile	improved turnstile for A-O-11 downlinks	ZL1AAN	MAY	32
weather sats	ATV relays	WB8QCD	MAR	76
ZRO tests; antennas	Hamsats	WA5ZIB	APR	76
Transceivers, Transmitters, Transverters				
220 MHz XVTR	construction	W6YUY	JAN	18
2m Mobile Rig	HT power booster	N8KDD	DEC	22
80m CW	construction	WB3ELL	FEB	28
Crystal Set	classic design improvement	Haas	APR	12
CW Transceiver	for 20m QRP	G3YCC	JUN	65
Direct Conversion	Receivers	WB8VGE	NOV	54
Direct Conversion	Receivers	WB8VGE	DEC	54
Flavorig!	80m CW rig project	KB1UM	NOV	12
G3IGU Transceiver	80m QRP	G3IGU	JUN	26
Microwave Oven	13cm QRO transmitter	KA9BYI	JUL	54
QRP CW	30m,40m transceiver project	NZ5G, N5HNN	JUN	20
		correction, schematic	SEP	88
QRP "Black Bag"	portable OSCAR station	N6DGK	JUL	26
QRP	6m tube transceiver	ex-YU1FR	JUN	50
Ramsey QRP-40	transmitter kit review	WB0E	DEC	32
Video				
AEA FSTV-430	ATV	WB0QCD	JAN	53
AEA FSTV-430	70cm ATV	N0IVN, NO9I, WB8ELK	JUL	20
Amiga AVT	SSTV/FAX interface	K3HKR	JUL	29
line sampler/7-pole filter	ATV	WB0QCD	FEB	64
Microwave Oven	13cm QRO transmitter	KA9BYI	JUL	54
PC Electronics' TX-33	33cm ATV transmitter	WB8ELK	JUL	44
SSTV for Atari ST	color SSTV	WB2OSZ	DEC	38
USATVS Net 75m	ATV	WB0QCD	JAN	53
weather sats	ATV relays	WB0QCD	MAR	76

*Actual titles of articles or columns are capitalized.

KEYWORD INDEX

Number 32 on your Feedback card

DECEMBER 1989 Issue #351

10 meter illegal activities ... 7
1N4001 ... 54
220 MHz ... 7, 60
2 meter mobile ... 22
40673 MOSFET ... 54
40 meter transmitter ... 32
6 meters ... 50
70 cm band ... 45
alternator whine ... 73
amateurity ... 96
AMSAT-OSCAR-13 ... 56
antenna PRB-1 ordinance ... 7
antennas AT-249/GRD; AT-339/PRC ... 53
antenna, WA6BFH loop ... 50
Atari ST ... 38
"Atlas" Radio ... 7
Augat/Alcoswitch ... 12
Australia ... 90
AX.25 ... 47
Brazil ... 89
Breadblox ... 25
brick oscillators ... 66
Communications Satellites ... 26
CSMA p-persistent ... 47
Dayton Hamvention '90 ... 60
direct conversion receivers ... 54
DXDA country list additions ... 64
Elenco Electronics ... 25
figure-8 problem ... 53
GaAs solar cells ... 89
Garrett IEU, Inc. ... 12
Grove Enterprises ... 26
Heath HW-9 mods ... 55
Hot Water Handbook ... 55
Hungary ... 90
IARC ... 90
IC manufacturing ... 72
Icom America, Inc. ... 29
Icom IC-2AT ... 9
Icom IC-2SAT ... 29
Icom IC-3SAT ... 60
Icom IC-745 ... 70
Israel ... 90
Japan ... 89
JAS-1b ... 89
K6MH, Jim Morrissett ... 96
KA1TGA, Jim Bail ... 17
KA1UKM, Linda Reneau ... 17
KA8HML, Thomas E. Wartel ... 9
Kaboom Micro Keyer update ... 64
KB1UM, Michael J. Geier ... 2, 18, 29, 72
Kenwood TH-21 ... 73
KC0V, Joe Moell, PE ... 50
KT2B, Pete Putman ... 45
Lithuania ... 89
LM324/350 op amp ... 54
love ... 96
Marshall Industries ... 12
Meadowlake Corporation ... 12
microwave oscillator ... 66
Mini Circuits Lab ... 54
Mirage D15 amplifier ... 45
Mirage, Inc. ... 45
mobile operation ... 50
Mode A RS-10/11 ... 24
Mode B ZRO tests ... 56
Mode S transponder ... 56
N5LKJ, Allan J. Fox ... 24
N8KDD, Mike Gray ... 22
Netherlands ... 89
Newark Electronics ... 22
packet ... 47
PL-259 connector ... 50
propagation ... 86
QRP-40/80 ... 32
Radio Kit ... 54
Ramsey Electronics ... 32
RCA CA3028A ... 54
RDFing ... 50
ROSE ... 47
RS 10/11 ... 24
RSGB no-code ... 7
RTTY on KAM ... 70
satellite operation ... 24
SBL-1 DBM ... 54
Signetics NE602 ... 54
Small Parts Center ... 54
South Africa ... 91
SSTV ... 38
SSTV publications, nets ... 42
switch box ... 70
TCP/IP ... 47
TLC1079 IC ... 9
VOX circuit ... 9
W1XU, Jim Gray ... 86
WA5ZIB, Andy MacAllister ... 26, 56
WA6ITF, Bill Pasternak ... 60
WB0E, Kenny A. Chaffin ... 32
WB2OSZ, John W. Langner ... 38
WB6IGP, C.L. Houghton ... 66
WB6RQN, Brian Lloyd ... 47
WB8VGE, Mike Bryce ... 54
WB9RRT, Larry R. Antonuk ... 37
Yaesu FT-411 ... 72
Yaesu FT-470 ... 18
Yaesu FT-620 ... 50
Yaesu FT-690R ... 50
Yaesu USA ... 18, 58

Number 32 on your Feedback card

BARTER 'N' BUY

QSLs TO ORDER. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DX-CC Honor Roll Certificate 2–4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

AZDEN SERVICE by former factory technician. Fast turnaround. PCS-300 NiCads $36.95. Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami FL 33157. (305) 238–3327. BNB262

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept A, 310 Commercial, Emporia KS 66801. BNB434

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept 73-3, 1196 Citrus, Palmbay FL 32905. BNB531

SB-220/221 OWNERS: 17 detailed mods which include 160–6 meter operation, QSK, +enhanced p.s. 50% rebate for new mods submitted! 9 pages of 3-500Z tech info. $11 postpaid.—Info. SASE, BOB KOZLAREK WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

ELECTRONIC KITS & ASSEMBLIES. For our latest catalog, SASE (45c) to: A&A Engineering, 2521 W. LaPalma, #K, Anaheim CA 92801. BNB624

HT-CLONE BATTERIES: ICOM: BP5 $42.95, BP-3S (2xBP3 Wall Chg) $42.95, YAESU: FNB2 $21.95, FNB10S//FNB12 $45.50, SANTEC: 142/442/1200 $22.95. "REBUILDING: SEND-UR-PACK" Icom BP3 $20, BP5 $28, BP7/8 $34, BP70 $35, Yaesu FNB9 $19 FNB10 $24 FNB4/4A $37, Kenwood PB21 $18, PB25/H/26 $25, "U-DO-IT REPAIR INSERTS" ICOM: BP3 $16.95, BP5 $22.95, BP7/8 $28.95, KENWOOD: PB21 $12.95, PB24/25/26 $19.95, TEMPO: S1–15/series $22.95 YAESU: FNB9 $14.95, FNB10 $18.95, FNB4/4A $32.95, AZDEN 300 $19.95. PORTA-PAC W/CHGR 12V5AHr $49.95, 1400LT Pack (25-3520/No-Plug) $54.95 "TELEPHONE / PAGER & COMMERCIAL PACKS" "FREE CATALOG." $3 shipping/order. PA+6%, VISA–M/C +$2. (814) 623–7000. CUNARD ASSOCIATES, Dept. 7, R.D. 6 Box 104, Bedford PA 15522. BNB628

ROSS' $$$$ USED December SPECIALS: KENWOOD PS-50 $179.90, MC-80 $59.90, TH-45AT $249.90, MS-1 $28.95, IF10B $47.90, ICOM U4AT $209.90, IC-3AT $179.90, IC-251A $369.90, BC-50U $59.90, YAESU FT-780R $399.90, FT-101E $399.90, FT-730R/YM50 $229.90, FRA-7700 $39.90, COLLINS 75-S1 $175.90, 32S1 $249.90, 516-F2 $199.90, AC-3805 $200.00 LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE, WE HAVE OVER 220 USED ITEMS in stock. MENTION AD. PRICES CASH, FOB PRESTON. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB654

WRITTEN EXAMS SUPEREASY. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $7 each. Advanced, Extra: $12 each. Moneyback guarantee. Bahr, Dept 73-3, 1196 Citrus, Palmbay FL 32905. BNB691

ROSS' $$$$ NEW HARD TO FIND SPECIALS: KENWOOD KPS-21 $99.90, VFO-700S $149.90, TR-8400 $379.99, TR-3600A $283.99, HMC-1 $46.90, TEN-TEC 222 $29.90, 252MOE $129.90, ICOM IC-701 $589.90, IC-38A/WHM-14 $328.99, IC-490A $549.90, IC-471A $689.99, EX-108 $109.90, EX-107 $55.90, YAESU FP-4 $39.90, FSP-1 $17.90 FT-YM-33 $49.99 , QTR24 $25.55, YR-901 $549.99, AMP SUPPLY LK550-NT/C $1999.90, LK450-ZC $899.90, ROBOT 450C $664.99, 800CH $599.99, 800H $329.99, AEA PK-64A/HFM $149.99, MP-20 $69.99, MP-64 $99.99, PM-1 $139.90. ALL L.T.O. (LIMITED TIME OFFER) LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE. Over 9004 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. PRESTON. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB709

$50 PACKET DIGICOM>64—software based PACKET for the Commodore 64. Software is public domain and requires a modem for the C-64 which is provided by our kit. Board plugs directly into cassette port or remote mounted via cable, both connectors included. Power derived from computer. Uses 7910 chip—no alignment required. Switch allows HF or VHF operation. Order Kit #154 for $49.95 or Assembly #154 for $79.95, both include FREE DISK. Add $2.50 s/h. A & A Engineering, 2521 W. LaPalma, #K, Anaheim CA 92801. (714) 952–2114. MC or VISA accepted. BNB732

HAM TRADER YELLOW SHEETS. In our 28th year. Buy, Swap, Sell ham radio gear. Published twice a month. Ads quickly circulate, no long wait for results. Send business size SASE for sample copy. $15 for one year (24 issues). P.O.B. 2057, Glen Ellyn IL 60138-2057 or P.O.B. 15142, Seattle WA 98115. BNB741

$$$$$ SUPER SAVINGS $$$$$ on electronic parts, components, supplies, and computer accessories. Send one dollar for 1-year subscription to our 40-page catalogs and their supplements. Get on our mailing list. BCD ELECTRO, PO Box 450207, Garland TX 75045 or call (214) 343–1770. BNB749

HAM RADIO REPAIR all makes, models. Experienced, reliable service. Robert Hall Electronics, Box 280363, San Francisco CA 94128-0363. (408) 729–8200. BNB751

WANTED: Ham Equipment and other property. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. All of the "22 Crew" want to wish our friends and supporters worldwide the very best holiday season ever. "Education Thru Communication" celebrates its tenth anniversary thanks to you. Please write us at: PO Box 1052, New York NY 10002. Round the clock Hotline: (516) 674–4072. BNB762

INDIVIDUAL PHOTOFACT FOLDERS. #10 to #1400, $4.00. #1401 up, $6.00. Sam's books, $7.00. Postpaid. Allen Loeb, 414 Chestnut Lane, East Meadow NY 11554. BNB766

AVANTEK ATF10135 $12.00, MMIC's, P.C. board, SASE: WA31AC, 7148 Montague St., Philadelphia PA 19135. BNB771

HAMLOG COMPUTER PROGRAM Full features. 17 modules. Auto-logs, 7-band WAS/DXCC. Apple $19.95. IBM, CP/M, KAYPRO, TANDY, CR8 $24.95. 73-KA1AWH, PB 2015, Peabody MA 01960. BNB775

ARCO GENESIS G-100 5 watt photovoltaic panel $79.95, Sovonics P-201, new design 24 watts $179.95 I ship. Mike Bryce, 2225 Mayflower NW, Massillon OH 44647. BNB812

1050+ DX AWARDS, 103 countries detailed in K1BV's Directory. $15.65. Ted Melinosky, 525 Foster St., South Windsor CT 06074-2936. BNB835

100 QSL CARDS $9! Shipping included. Free samples. Shell Printing, KD9KW, PO Box 50A, Rockton IL 61072. BNB859

WIRE ANTENNAS and accessories, antennas from $10, coffee cups, call-sign plaques. SASE for list. W8EV Products, 205 W. First St., Arcanum OH 45304. BNB865

CURRY COMMUNICATIONS proudly introduces a complete line of easy to build kits for L.F. and 1750 meters. Please write for brochure. Curry Communications, 852 North Lima Street, Burbank CA 91505. BNB874

RIT KITS for most transceivers, $15. Includes shipping. Loren Wallen KA7AZM, 6323 S.W. 100th, Tacoma WA 98499. BNB885

LOW COST HAM GEAR. SASE for free list. WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

Barter 'N' Buy advertising must pertain to ham radio products or services.
☐ **Individual (noncommercial)** ..... **50c per word**
☐ **Commercial** ..... **$1.50 per word**
Prepayment required. *Count only the words in the text. Your address is free. 73* cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue. Please print clearly or type (double-spaced).

_____
_____
_____
_____
_____
_____

No discounts or commissions are available. Copy must be received in Peterborough by the first of the second month preceding the cover date. Make checks payable to *73* Magazine and send to: Donna DiRusso, **Barter 'N' Buy, Box 278, Forest Road, Hancock, NH 03449.**

SURPLUS CATALOG. 72 pages. $2. Surplus, PO Box 276, Alburg VT 05440. BNB891

BIRD ELEMENTS, WATTMETERS, DUMMY LOADS—Buy and Sell. (609) 227-5269. Eagle, 100 Dearborne Ave. Blackwood NJ 08012. BNB894

WANTED: All types of Electron Tubes. Call toll free 1 (800) 421-9397 or 1 (612) [illegible]3-9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB900

CAD/CAM PHOTOPLOTTING . . .for any RS-274 Gerber Photo Plot file produced from your PC Cad program. 8" x 10" Negative or Positive Photoplots start at $15. Call for details. KENPRO CIRCUIT SYSTEMS, FENTON MO. 1 (800) 325-3878/1 (314) 343-1630 in MO. BNB902

QSLs & RUBBER STAMPS—TOP QUALITY! States, World Maps, USA, Key, Shuttle, Globe QSLs. Report Form Rubber Stamps. More! Samples $1.00 (Refundable With Order.) Ebbert Graphics D-7, Box 70, Westerville OH 43081. BNB903

DIGITAL AUTOMATIC DISPLAYS. Be specific. 45¢ S.A.S.E. GRAND SYSTEMS, Dept. A, PO Box 3377, Blaine WA 98230. BNB908

HAM-SOFT—Public Domain Software For Amateur Radio. Hundreds of titles, lowest prices, satisfaction guaranteed! IBM, C-64, MAC, VGA Graphics, more. Catalog $1.00 refunded first order. HAM-SOFT, PO Box 2525, Morgan City LA 70381. BNB909

HAM SOFTWARE IBM/Compatibles 10 disks $26.95. MC/VISA/Discover. N5ABV EAPCO/7, PO Box 14, Keller TX 76248-0014. (817) 498-4242. 1 (800) 869-7208. BNB911

ELECTRON TUBES: All types & sizes. Transmitting, Receiving, Microwave . . .Large inventory = same day shipping. Ask about our 3-500Z special. Daily Electronics, PO Box 5029, Compton CA 90224. (800) 346-6667. BNB913

ICOM, KENWOOD & YAESU OWNERS: Informative separate Newsletters. 10th year. USA Bulk ($10.50) F.C. ($12.50) Canada ($13.00). Elsewhere ($14.00 & $18.00). Free Catalog. Send (45¢) SASE. International Radio & Computers, Inc., 751 South Macedo Blvd., Port St. Lucie FL 34983. 1-407-879-6868. BNB914

WANTED RF JAMMING: Knowledge and or equipment. Also highly sensitive hearing devices: medical or surveilliance. Eugene Dell, 300 Bentwood Ave., Johnstown PA 15904. BNB915

HAM-SWL-SCANNER BOOKS. Catalog $1. Tiare, PO Box 493/S, Lake Geneva WI 53147. BNB916

COMMODORE 64 HAM PROGRAMS—16 disk sides over 200 Ham programs $16.95. 25¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. HomeSpun Software, Box 1064-BB, Estero FL 33928. BNB917

AMIGA, MACINTOSH, & ATARI XL/XE/ST Amateur Radio software. We have several public domain disks available for trade or $4.00 each. Send business size SASE specifying computer for list. Write WA4EFH, PO Box 1646, Orange Park FL 32067-1646. BNB918

MACINTOSH HAM SOFTWARE-DX HELPER™ gives you bearing, distance, gray line map, custom Great Circle maps, MUF, call sign identifier, CW code practice, beam heading charts, much more! See *73* October '89, p. 59. $39.95 Ppd. Track the MicroSats with SATELLITE HELPER™. Polar, Great Circle, Rectangular graphics, view from space, az, el, alt, range, doppler, etc. Sun and Moon, too! Rotor control with Mirage/KLM interface. See August '88 *QST* p. 87. $59.95 Ppd. Pro version $99.95. SASE or call for more info. MacTraksrgetr Software, PO Box 1590, Port Orchard WA 98366. (206) 871-1700. BNB919

BETTER THAN BOOKS—EASIER THAN A COMPUTER. Quick, Easy and Simple—a complete line of carry along Study Cards covering Novice through Extra. All questions—answers—and pictures right at your fingertips on file cards. Divided into logical segments, these study cards were developed after a need arose for a better method of studying for the written exams. Question and correct answer appear on one side (with Key Words underlined in both Question & Answer). The other side contains the question with the four multiple choice answers as a convenient Quiz. Recommended and used by Amateur Clubs for upgrades and to aid XYLs and children just getting started. Info on Request from VIS PO Box 16646, Hattiesburg MS 39402. BNB920

DOSSAT SATELLITE TRACKING SOFTWARE Tabular and EGA Format, IBM-PC compatible. $30. PO Box 37, Redmond WA 98073-0037. BNB921

WANTED: QST-S for 1916 and 1917. R. Arrowsmith, W4JNN, 3505 Woodburn Rd., Annandale VA 22003. (703) 560-7161. BNB922

. . . de K6MH

Amateur, from Latin amare, to love. One who engages in activity for the beauty of it.

Amateurity

I'm wary of the word "amateurish." It's a put-down I dislike, as if "amateur" means "immature" and where it's really at is to be "professional." The word "professional" has been given lots of moxie compared to "amateur" and I question this.

An amateur is a person who does something for the love of it, for the intrinsic value of it, the adventure, the discovery, the hope of presenting something new or useful to others. Amateurs are not motivated primarily by the desire to serve their fellow beings, but it often turns out that way. Why? Because something done for the beauty of it makes good waves.

What bothers me is all the efforts going on in the world that are not amateurish, but what we might call "professionalish." Professionalism dates back to the oldest profession (remember that one?), and pros have been with us ever since.*

Think it over. Where have the great advances come from? Amateurs. And who is busy at work destroying the planet, from the rape of the rain forests to the pollution of air, water, and soil? Professionals, people who are *over*employed doing something they don't like, don't feel really good about, because they think they must.

It's been said, The world is for lovers. Is it so? Loveless, nonamateur acts are about to do us in. Maybe we should look again to the beauty of what we do, rather than to the means of exploiting it for the almighty buck. I say we need more amateurs . . .and more amateurity among the professionals.

By definition, children are amateurs, amateurs who society makes every effort to professionalize. We may need more unconverted amateurs, children allowed to grow up following their curiosity, being "a light unto themselves," rather than being "whipped into shape."

The word *amateurity* has entrenched itself in my vocabulary. It's yours to use if you like. To me it means real maturity, a love of action for its own sake not only in youth but in the full-grown human who has not lost this love, this amateur spirit, or has lost it for a time, but thank God, regained it.

WW III

Hams are famous for coming through in emergencies. What we fail to realize is that we are embroiled right now in the greatest emergency mankind has ever known: wholesale extinction of species, destruction of the subtle web of support from plankton through myriads of flora and fauna all the way up to us "higher types," an interdependent design that works well only when none of the parts are missing.

World War III is already happening. It's a war worth fighting, a global war against *ignore-ance*, a war that none of us can escape.

From lesser emergencies in the past we have learned this: Without communication we are lost. . . .de K6MH

*I've heard since that the oldest profession is shamanism, but I couldn't resist the dig.

How About . . .

. . .An Instantaneous Direction Finder for transmitter hunting? One that uses a phased array switched electronically, to give a reading in less than a second, with no physical rotation needed?

. . .A unisex word for "he/she," "him/her?"

. . .Educational amateur radio, a way to participate in lifelong learning for young and old, shut-ins and travelers, via 2m repeater nets?

. . .Sharing who's behind the Wizard-of-Oz cabinet, instead of cataloging what the cabinet consists of (rig, antenna, etc.)?

. . .More ideas from you, the reader, for future "How About's."

Compare...Ours & Theirs

Choosing the radio that's right for you can be pretty confusing. That's why we decided to make it as simple as possible for you to see how these Yaesu hand-helds stack up against the competition. No boasts, no sales pitches, just a factual side-by-side comparison of "ours" versus "theirs." Because Yaesu quality speaks for itself.

2 METER HANDHELD SPECIFICATIONS	YAESU FT-411/811	ICOM IC-2SAT/IC-4SAT	KENWOOD TH-215/TH-415
Memory Channels	49	48	10
VFOs	2	1	1
Memory Channels Store Any Offset	49	10	10
Wide Receiver Frequency Range (MHz)—VHF	140-173	138-174	141-163
Wide Receiver Frequency Range (MHz)—UHF	430-450	440-450	438-450
Built-in CTCSS Encode/Decode	Included	Option	Encode Only
Memory DTMF Autodialer	10	None	None
CTCSS Paging	✓	Option	—
Programmable Battery Saver	✓	✓	✓
Backlit LCD Display	✓	✓	✓
Backlit DTMF Keypad	✓	—	—
APO, Automatic Power Off	✓	✓	—
1 MHz Up/Down Stepping	✓	✓	✓
Vinyl Case	✓	Option	Option
Scan For CTCSS Tone	✓	—	—
Built In VOX	✓	—	—
Clock	—	✓	—
Odd Split, Any Tx Or Rx Frequency In Any Memory Channel	49	10	1
Suggested Retail Price	$406.00*	$439.95*	$349.95*

DUAL-BAND HANDHELD SPECIFICATIONS	YAESU FT-470	ICOM IC-32AT	KENWOOD TH-75A
Memory Channels	42	20	20
VFOs Per Band	2	1	1
Wide Receiver Frequency Range (MHz)—VHF	130-180	138-174	140-164
Wide Receiver Frequency Range (MHz)—UHF	430-450	440-450	438-450
Built-in CTCSS Encode/Decode	Included	Option	Encode Only
Memory DTMF Autodialer	10	None	None
Dual Receive With Balance Control	✓	—	✓
CTCSS Paging	✓	—	✓
Cross Band Full Duplex	✓	✓	✓
Programmable Battery Saver	✓	✓	✓
Backlit LCD Display	✓	✓	✓
Backlit DTMF Keypad	✓	—	—
Alternating Band Scan	✓	✓	✓
Cross Band Repeater	✓	—	—
Power Output on 2 Meter and 440	2.3W	5.0W	1.5W
APO, Automatic Power Off	✓	—	✓
1 MHz Up/Down Stepping	✓	✓	✓
Memory Channels Store Any Offset	42	20	20
Vinyl Case	✓	Option	Option
Odd Split, Tx Or Rx, Any Frequency In Any Memory Channel	42	20	2
Suggested Retail Price	$576.00	$629.00	$549.00

YAESU

17210 Edwards Road Cerritos, CA 90701 (800) 999-2070

Data and prices obtained from latest available manufacturers' brochures & printed material. October, 1989.

*VHF Radios only.

© 1989 Yaesu USA

KENWOOD

TM-731A/631A

144/450 and 144/220 MHz FM Dual Banders

- Extended receiver range (136.000 – 173.995 MHz) on 2 m; 70 cm coverage is 438.000 – 449.995 MHz; 1-1/4 m coverage is 215 – 229.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144 – 148 MHz. Modifiable for MARS/CAP. Permits required.)
- Separate frequency display for "main" and "sub-band."
- Versatile scanning functions. Dual scan, and carrier and time operated scan stop.
- 20 memory channels. Stores everything you need to make operating easier. Two channels for "odd splits."
- 50 Watts on 2 m, 35 watts on 70 cm, 25 watts on 1-1/4 m. Approx. 5 watts low power.
- Automatic offset selection.
- Dual antenna ports.
- Automatic Band Change (A.B.C.) Automatically changes between main and sub-band when a signal is present.
- Dual watch function allows VHF and UHF receive simultaneously.
- CTCSS encode/decode selectable from front panel or UP/DWN keys on microphone. (Encode built-in, optional TSU-6 needed for decode.)
- Balance control and separate squelch controls for each band.
- Full duplex operation.
- Dimmer switch.
- 16 key DTMF/control mic. included.
- Frequency (dial) lock.

Optional Accessories:

PG-4H Extra interface cable for IF-20 (for three to four radios) • **PG-4J** Extension cable kit for IF-20 DC and audio • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SWT-1** 2 m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-41** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-700** Dual band 2 m/70 cm mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

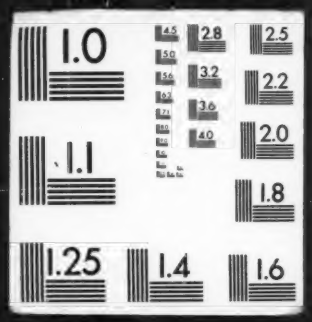
KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

pacesetter in Amateur Radio

KENWOOD

"Dynamic Duals"


1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8